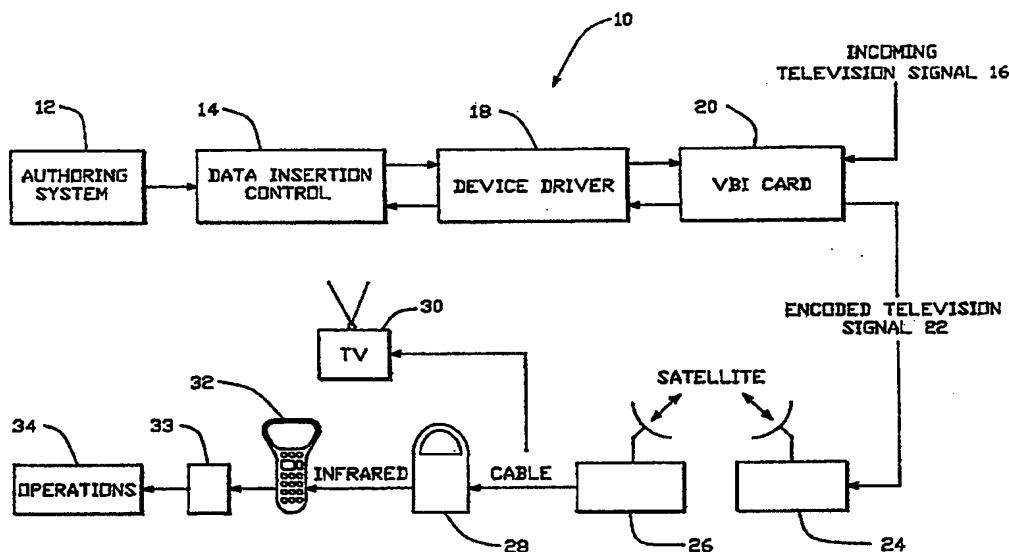




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(54) Title: TRANSACTION BASED INTERACTIVE TELEVISION SYSTEM



## (57) Abstract

An interactive television system is disclosed where interactive information is inserted in the vertical blanking interval of a standard television signal (20) or some other appropriate medium. The signal is received and decoded by a settop device (28) which sends the decoded signal, via an infrared signal, to a handheld device (32). The system includes an interactive program authoring system (12), and programmer tables in the memory of the handheld device which store data for various interactive events. This system allows a viewer to enter and exit events at any time without having to wait for information to be downloaded and without losing scores. Furthermore, this system allows many interactive programs to run concurrently over extended periods of time while maintaining cumulative scores in the handheld device for each interactive program or series of programs.

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## TRANSACTION BASED INTERACTIVE TELEVISION SYSTEM

### CONTINUATION APPLICATION INFORMATION

This Application is a continuation-in-part of co-pending Application Serial No. 07/796,085, filed November 20, 1991.

### CROSS-REFERENCE TO RELATED APPLICATIONS

This application is related to the following application, which is assigned to the assignee of the subject application:

5 "INTERACTIVE TELEVISION SECURITY THROUGH TRANSACTION TIME STAMPING", inventors John P. Lappington Susan K. Marshall, Wayne Y. Yamamoto, Cameron A. Wilson and Richard S. Simons, Application SC/Serial No. not yet known, filed concurrently with this application.

The above related application is incorporated herein by reference.

### 10 BACKGROUND OF THE INVENTION

#### Field of the Invention.

The present invention is directed to an interactive television system and in particular, one adapted for use with existing broadcast, cable, and satellite television or radio or other communication systems for allowing participants and viewers to  
15 interact with the system in order, by way of example only, to shop, enter into games of skill, and engage in educational presentations and other events where information is provided and the participant or viewer can make an appropriate response thereto.

#### Description of the Related Art.

20 Many interactive television products have been introduced that provide the capability for the viewer to participate in television programs. These products accept cue signals transmitted to handheld devices that measure and control the response of the viewers as the viewers participate in the program. Some of these devices implement hardware that monitors the response or the results of responses  
25 accumulated over time and reports the results to a central site. One of the early

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embodiments of this technology was the QUBE interactive two-way television system introduced by Warner Communications at least as early as 1982. Other systems include the INDAX system field tested at least as early as 1984 by Cox Communications.

5           The interactive television products currently known fall generally within one of two categories. The first category includes systems having firmware in a remote participant's handheld device such that the participant can start playing along with the interactive program as soon as the programs begins. Such a system has limited capabilities in regard to supporting multiple varieties of interactive programs due to  
10           the size limitation and permanence of the firmware. The second category maintains the software in random access memory in the viewer's handheld device such that the program must be downloaded into the device prior to the event starting. This process may take up to five minutes, requiring the participant to wait prior to participating in the interactive program. Both categories of devices are designed to  
15           work with one interactive program at a time, where the participant must complete that program before being able to participate in a new program.

          When the above described products are compared to the television viewing habits of most viewers, significant deficiencies are apparent. Most viewers do not continuously watch one program. Viewers generally switch between several  
20           channels. This is so pervasive in the industry that the terms "grazing" and "surfing" have been given to the habit of switching between channels during the programs.

          None of the prior art interactive systems allow for interactive programs to be presented concurrently on different television channels so that a viewer may change channels ("graze" or "surf") during the middle of a first interactive program and join  
25           a second interactive program already in progress. This would also be a useful feature for a viewer who turns on the television late or who wants to take part in more than one program that overlaps. For example, a viewer may want to play along with a football game but interact with an educational program during halftime. Or, if the viewer starts playing one game and realizes that he or she does not like  
30           the program, then the viewer can change channels and join a second program that is already in progress.

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Furthermore, the prior art systems require a viewer to schedule an interactive program in order for the system to download the program and tune to the correct television signal, or the viewer must manually tune the interactive system to the correct channel. Thus, if a viewer wishes to change programs (or surf) the viewer must change the television tuner and the interactive system tuner.

Accordingly, an interactive system concept that is compatible with the participants viewing habits is required for interactive television to be successful. This system must include the ability to interleave (or surf between) several interactive programs at the same time and not require a significant amount of advance downloading of programs or initialization information. When the viewer tunes the channel, the viewer should almost immediately be able to participate in the interactive program either if the viewer is for the first time watching that program or the viewer is returning after watching some other program for a brief or extended period.

In the situation where a viewer returns to a program that was previously watched, the interactive game should continue, leaving out only the part that was missed. Any cumulative score for the part of the event actually participated in should be maintained. The result should be the same as if the missed questions were not answered.

The prior art systems do not address these needs and do not allow for viewers to play along with a series of events and maintain a cumulative score. For example, it may be desirable to set up an interactive program to play along with the World Series (7 games), where the viewer guesses the next pitch. At the end of the first game it would be desirable to save the score for that particular game. The viewer can then play along with the second game of the World Series, with the score of the second game added to the score of the first game to maintain a cumulative score that would not be effected should the viewer play along with an educational event during the time period between the first and second games. An analogous use is a child playing along with an educational program, where a cumulative score representing the sum of scores over weeks of interactive play could track the child's progress in learning, for example, to spell or multiply.

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In order to efficiently and economically create such a sophisticated interactive program, as described above, the interactive system would need components that enable advertisers, networks, television producers, etc., to create intricate interactive programs without first becoming experts in the interactive technology or computer programming. Such a system must also allow for various forms of live and delayed programs; for example, constructing interactive programs for live sporting events, reruns of sitcoms, educational programs or game shows.

#### SUMMARY OF THE INVENTION

The present invention is directed to overcome the disadvantages of the prior art.

It is, therefore, an object of the present invention to provide a transaction based interactive television system that can create, encode, transmit and present sophisticated interactive programs.

Another object of the present invention is to provide an interactive system that can broadcast many interactive programs at the same time over different channels, allowing viewers to graze or surf between channels or interleave among concurrent interactive programs. The system also allows interactive programs to be timed interleaved on the same channel while maintaining viewer interactivity and accumulating scores with respect to all programs.

Still a further object of the present invention is to provide for an interactive system that allows many programs to be broadcast on the same channel at different times such that scores and data associated with a first interactive program will not be altered when a second interactive program is presented.

Yet another object of the present invention is to provide for an interactive system that allows for a series of interactive programs to be broadcast over extended periods of time where the system can maintain a series or cumulative score.

A further object of the present invention is to provide an interactive system that does not need to be tuned to a television signal as a separate step from tuning the television.

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An additional object of the present invention is to provide for an interactive system with flexible programming capabilities. The system could be used with interactive programs of various length, sophistication and format.

5 Still another object of the present invention is to provide an interactive system that allows for interactive program writers, not educated in computer programming or interactive hardware, to create a sophisticated interactive program.

A further object of the present invention is to provide an interactive system that allows for various modes of presenting interactive programs including live and pre-programmed.

10 An additional object of the present invention is to provide an interactive television system that has four modes of inserting data into a television signal. First, data is inserted into the television signal as it is created. Second, data is stored in a memory element, and inserted in the television signal on command of an operator. Third, data is created with timing information. And fourth, data is assigned to a  
15 specific television frame.

Another object of the present invention is to provide for an interactive system that is compatible with the participants viewing habits. This system includes the ability to maintain several interactive programs active at the same time and not require delays downloading of programs or initialization information. When the  
20 viewer tunes the channel, the viewer is almost immediately able to participate in the interactive program either if the viewer is for the first time watching that program or the viewer is returning after watching some other program for a brief or extended period. In the situation where a viewer returns to a program that was previously watched, the interactive game continues, leaving out only the part that was missed.  
25 Any cumulative score for the event actually participated in can be maintained. The result would be the same as if the missed questions were not answered.

The present invention is an interactive television system designed to overcome the problems and disadvantages associated with the prior art and to address the way participants actually view television events.

30 Interactive television adds an exciting dimension to current television programming by increasing viewer involvement. For example, interactive television can make game shows more exciting for viewers who can play along with the on-air

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contestants. Sporting events become more fun for viewers who can judge competitions, match wits with the coaches and test their knowledge of the game, its stars and history. Original classics, reruns and re-aired programs are more entertaining for viewers who participate in solving mysteries and puzzles, and  
5 answering trivia and pop culture questions. News, documentary, and talk shows are more compelling for viewers who receive additional information on the subjects on which they are interested in, participate in polls on topics that concern them, and learn important self-help tips. Movies can be enriched with trivia games and information. Music videos, specials and variety shows are more interesting with  
10 viewer judging, surveys and pop culture questions. New programs, including premiers and special events will attract larger audiences through interactive promotions and contests. Interactive promotions and contests provide an incentive for viewers to stay with programs for their entirety, and to tune into a series consistently over the course of a day, week, or season.

15 Additionally, interactive television creates an active viewing experience that can highlight the educational, informational and public service aspects of television. As a result, viewers will feel better about their television viewing, and thus will be more interested in watching television for longer periods of time. For example, interactive television could be used to turn cartoons into learning and entertaining  
20 experiences. A TOM AND JERRY cartoon could include an interactive question asking, "If Tom caught 22 mice and ate 10, how many would he have left?" Thus, a child can enjoy cartoons and simultaneously learn.

Interactive television's enhancement of the viewer's experience translates into benefits for networks, producers and advertisers. An interactive television system  
25 can increase viewership, build viewer loyalty, increase television's educational value, enhance a networks image, enhance on-air promotion, create new opportunities for advertiser involvement, enable a network or cable station to get to know its audience and generate additional sources of revenue. Furthermore, interactive programs can increase viewer awareness and promotional exposure without decreasing ad spot  
30 inventory. For example, interactive programming can be an ideal tool for creating self-liquidating promotional campaigns utilizing advertiser tie-ins. Special messages and games can entice viewers to watch commercials. Alternatively, a network can



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team with sponsors to promote and benefit from merchandising possibilities such as logo merchandising, marketing clothes and selling books authored by talk show guests.

5 Furthermore, interactive programming allows networks, advertisers, or other interested entities to understand the audience by taking advantage of interactive televisions' data gathering tools. For example, audience demographics, such as number, age, gender and income of viewers, can be collected. Polling questions can be asked to determine the likes and dislikes of a given audience.

10 The present invention provides for a transaction based interactive television system whereby the various interactions between the system and the viewer, which can occur over a period time, can be broken down into and defined by a plurality of transactions. The transactions preferably are presented through data sent over and incorporated in the vertical blanking interval ("VBI") of the television signal although other methods are presented in the available literature. The transactions use  
15 programmer tables which are provided in a memory device in, for example, a handheld device used by the viewer to interact with the television presentation.

With a transaction based system, multiple games and interactions dealing with different subject matter can be accomplished in an interleaved manner. For example, during an hour long television presentation, a number of transactions can be strung  
20 together in order to interact with a continuous theme being presented in the main programming for that hour. Additionally, should the main programming be broken down into sections, the transactions can be grouped as necessary in order to represent the desired interactivity with each portion of the main program.

The present system has the capability of allowing, for example, a transaction  
25 or grouping of transactions to take place for each of the multiple commercials which are spread throughout the main presentation. Thus, the present system affords the ability for the viewer to play and interact with multiple transactions which can be associated with totally different interactive presentations on the screen, which can be time independent, and have all of the interactions properly recorded and scored.  
30 Because each transaction can be programmed through the use of only a few VBI lines, the system allows a viewer to begin playing a game or interacting with the television presentation during substantially any portion of the presentation and also

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allows the viewer to switch channels, "graze" or "surf" and still be almost immediately able to play or interact with any game or presentation presented on the newly selected channel.

5 This ability presents a significant advantage over the prior art which requires, as indicated above, that the viewer pre-tune to a specific channel ahead of the game time so that the necessary game software can be downloaded, over a significant interval of time, into the remote terminal before the game can be commenced.

10 The present invention relates to an interactive system that includes an authoring system for creating sophisticated interactive programs, a data insertion system for inserting the interactive programs into the vertical blanking interval or other portion of a television, radio or other signal, means for transmitting the encoded television signal to remote sites, a settop device for stripping the interactive data from the television signal, and a handheld apparatus that presents the interactive program and allows the viewer to participate in the interactive program.

15 Furthermore, the present invention need not specifically be tuned by the viewer to the appropriate channel. Rather, the interactive system monitors the signal tuned into by the television.

20 In one embodiment, the system includes a receiver that receives during a first time interval a first set of interactive data including a first set of commands and a first set of event specific data associated with a first event. During a second time interval, the receiver receives a second set of interactive data including a second set of commands and second event specific data associated with a second event. The system further includes a means for presenting the first event to a viewer based on the first interactive data. The presentation means also presents the second event to  
25 the viewer based on the second interactive data. The system further includes a memory unit in communication with the presentation means that includes a first programmer table storing transaction data associated with the first event and a second programmer table storing transaction data associated with the second event. Presenting transactions based on the first interactive data does not effect the second  
30 programmer table. Presenting transactions to a viewer based on the second interactive data does not effect the first programmer table.

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The data insertion system also includes a gate keeping ability, related to a valid stamp within the interactive data, which allows the data insertion system to prevent the handheld from acting on invalid data. The data insertion system can also assign priorities to tasks and download lower priority information at appropriate times. Script data would have the highest priority, while cross-promotional data, mail and bulletin board activities would have a lower priority and be sent when high priority data is idle.

The data insertion system also includes FEC coding, encrypting, CRC and interleaving, which allows for recovering a lost VBI line as well as random bit errors.

In another embodiment, the memory unit has a plurality of programmer tables for storing data. The plurality of programmer tables includes a secured programmer table, an unsecured programmer table and an event specific programmer table. The programmer tables can be leased or licensed for various lengths of time. Access codes can be sold to script writers over phone lines. These codes will allow the script writer to use selected programmer tables for selected periods of time.

In one embodiment, the interactive system includes a handheld unit for interacting with the television program. The handheld unit includes a memory element, a keypad for entering data, and a processor which controls the presentation of interactive events or programs.

In one embodiment of the invention, an authoring system is included which has a means for choosing a programmer table from the plurality of programmer tables and means for creating a script. The means for creating a script includes one or more of means for creating a message, creating a question, creating appropriate responses, and for creating response criteria. This embodiment further includes a means for compiling the script to create interactive data. The authoring system allows the script writer to create a mini-game. Mini-games allows a user to play a game within a game.

The present invention includes a method for receiving and presenting interactive programs on an interactive system. The method can utilize an interactive system which includes a memory unit having a first programmer table with a first identification code and a second programmer table with a second identification code

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different from the first identification code. The steps of the method include receiving first interactive data, the first interactive data preferably including commands and event specific data containing a reference to the first identification code. The viewer is presented with a first transaction based on the first interactive data without effecting the second programmer table. The first programmer table is updated based on the first transaction without effecting the second programmer table. Second interactive data is received. The second interactive data preferably includes commands and even specific data containing a reference to a second identification code. The viewer is presented with a second transaction based on the second interactive data without effecting the first programmer table. The second programmer table is updated without effecting the first programmer table. Third interactive data is received. The third interactive data preferably includes commands and event specific data containing a reference to the first identification number in order to use the first programmer table. The viewer is presented with a third transaction based on the third interactive data without effecting the second programmer table. The first programmer table is updated by the third interactive data without effecting the second programmer table. With this method, the system allows for two programs to be interleaved using designated programmer tables.

Thus, the present invention interactive television system allows many different interactive programs to be broadcast at different times on the same channel; many interactive programs to broadcast at the same time on different channels; one interactive program to be broadcasted at the same time on different channels; and multiple programs to use the same programmer table at different times. This multi-channel/multi-user feature coupled with the handheld user's ability to interleave games on different channels provides a more versatile system than any disclosed in the known prior art.

These and other objects and advantages of the invention will be appear more clearly from the following description in which the preferred embodiments of the invention have been set forth in detail in conjunction with the drawings.

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### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 depicts a block diagram of the interactive television system.

Figure 2 depicts a partial block diagram of the interactive television system configured for adding interactive data to a videotape.

5        Figure 3A is a flow chart and block diagram explaining the Main Menu of the Authoring System.

Figure 3B is a flow chart and block diagram explaining the Script Menu of the Authoring System.

10       Figure 3C is a flow chart and block diagram explaining the Message Window of the Authoring System.

Figure 3D is a flow chart and block diagram explaining the Question Window of the Authoring System.

Figure 3E is a flow chart and block diagram explaining the Response Window of the Authoring System.

15       Figure 4 is a block diagram of the Insertion Card of the Present Invention.

Figure 5 shows the travel of the cathode ray, and the lines of data on a standard television.

Figure 6 shows the data structure on the Vertical Blanking Interval.

Figure 7 depicts the data spacing for the data of Figure 6.

20       Figure 8 shows the format of the interactive data transmitted on the vertical blanking interval.

Figure 9 is a block diagram of the settop device.

Figure 10 is a block diagram of the handheld.

Figure 11 depicts a top plan view of the handheld.

25       Figure 12 depicts a representation of the infrared coverage area for the present invention.

Figure 13 is a Memory Map for the handheld.

Figure 14 is a block diagram of a programmer table.

30       Figure 15 depicts an example of how the registers in the handheld are updated during a transaction.

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DESCRIPTION OF THE PREFERRED EMBODIMENTSI. System Overview

Figure 1 shows interactive system 10. An authoring system 12 is used to  
5 create/program interactive data. That is, a programmer (also called a script writer)  
develops a set of questions or informational statements to be sent to a viewer during  
a television broadcast. Questions could also be accompanied by responses, response  
criteria and/or scoring criteria. The script writer could also determine when during  
10 the broadcast the questions should be transmitted and presented, and how a question  
will fit into an overall game or series. A script writer using authoring system 12  
creates commands and event specific data, which are used to present the interactive  
program to a viewer.

After a script writer creates the interactive program, the interactive data is  
first sent to data insertion control 14, which controls the insertion of interactive data  
15 preferably into the vertical blanking interval ("VBI") of incoming television signal  
16. Television signal 16 can be, for example, a show to be aired on a network such  
as a sitcom or baseball game. Insertion control 14 utilizes Insertion Card 20 to  
insert the interactive data onto television signal 16.

There are four different modes for inserting data onto the VBI. The first  
20 mode is a straight insertion. Interactive data is designed using authoring system 12  
and is sent to data insertion control 14, which places it immediately into the VBI of  
television signal 16 to create encoded signal 22. Encoded signal 22 can be  
immediately transmitted to home viewers or video taped. A second mode is to pre-  
produce the interactive data with time data. Data insertion control 14 would insert  
25 the interactive data onto the VBI at the appropriate time. Third, the information  
could be pre-produced for real time insertion into a live event. In this situation the  
data would be stored in a memory device and an operator would, via a control panel,  
signal when a given transaction should be encoded on to the VBI. Finally, it is  
contemplated that interactive data could be designed and synchronized to a specific  
30 video frame.

Insertion Card 20 adds (or encodes) the interactive data to the VBI lines of  
television signal 16, and sends the encoded television signal 22 to a transmitter, all

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at the direction of data insertion control 14. Data insertion control 14 is responsible for processing, scheduling, time stamping and validation, as well as administrative functions associated with data insertion. Device driver 18 serves as an interface between Insertion Card 20 and data insertion control 14. In an alternative  
5 embodiment, rather than using the VBI lines, interactive data could be transmitted using the audio portion of a television signal, luminance, digital packets, radio communication or other appropriate mediums.

Encoded television signal 22 can be sent from satellite transmitter 24 and received by a satellite receiver 26. It is contemplated that satellite receiver 26 could  
10 be part of a cable system where the signal received by satellite receiver 26 is then sent via cable TV to home viewers. Instead of using a satellite and a cable system, the television signal could be broadcast using a standard television transmitter, transmitted using straight cable without satellites or transmitted with any other means for transmitting a television signal.

15 The signal received by satellite receiver 26 is sent to the home viewer where it is received by television set 30 and settop device/converter 28. Television 30 plays the original television program. Settop device 28 receives the encoded television signal and strips out the interactive data. Settop device 28 sends the interactive data by infrared transmission to handheld 32, which presents the  
20 interactive program to the home viewer. Thus, while the home viewer watches TV 30, the viewer can participate in the interactive program presented on handheld 32. Although infrared transmission is preferred, any other means for transmission will suffice; for example, radio communication or a wire. Transmission via infrared or radio is more efficient than a wire because many viewers, each with their own  
25 handheld, can participate simultaneously.

Upon completion of an interactive program the viewer could register his/her score with operations 34, which would be a central or regional office for collecting scores, survey information, etc. Registering can be accomplished utilizing many alternatives. The preferred method for registering scores includes handheld 32  
30 transmitting, via infrared communication, the registration information to dialer 33. After receiving the registration information, dialer 33, which includes a modem, sends the information to operations 34.

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Alternative methods for registering scores include a home viewer reading a code from handheld 32 to an operator over conventional telephone lines, the viewer inputting a code into a central computer using the touch tone keys on the telephone, or including a modem inside handheld 32 so that handheld 32 can communicate over the telephone lines with a computer at operations 34. It is also contemplated that a viewer could contact operations 34 via a radio signal, cable or another communication medium.

Figure 2 shows the interactive system configured to add an interactive program to a pre-existing television signal that is on a video tape or equivalent. Play tape deck 40 is used to play source tape 42, which contains the pre-recorded television program. Play tape deck 40 can be used to read time codes from source tape 42 or there can be a time code generator inserted between the play tape deck 40 and the time code reader 44. Time code reader 44 reads the timing information in order to determine when data may be inserted, and transmits this information to data insertion control 14. As described with respect to Figure 1, data insertion control 14, in conjunction with device driver 18 and Insertion Card 20, inserts interactive data into the signal emanating from source tape 42. The encoded signal is sent to record tape deck 46 and recorded on encoded tape 48, which will contain the pre-recorded television program plus the interactive data. Encoded tape 48 can then be stored for later broadcast.

When a television program (live or pre-programmed) with interactive data is broadcast, the interactive data will be transparent to viewers that do not have the interactive system. That is, someone without handheld 32 will not know that an interactive data is being presented.

Each of the components described above in regard to Figure 1 will be discussed in more detail below.

## II. Authoring System

As described above, the authoring system is the software application used to create interactive programs. The preferred embodiment authoring system 12 is a computer (IBM PC 386 or 486, or any other programmable computer) using authoring system software (a windows application) that generates interactive data



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including commands and event specific data. While the script writer is designing an interactive program, a script file is created that includes an English-like description of the various questions and answers etc., for an interactive program. Authoring system 12 includes a two part compiler. During the first phase of the compilation, a symbolic file is created from the script file. The symbolic file is analogous to source code associated with a typical computer program. During the second phase of the compilation, an object file is created from the symbolic file. The object file contains commands and event specific data that is read by the data insertion system. The commands could be part of a proprietary high level command language or any other assembly-like commands.

When the interactive program is at the creation stage, on authoring system 12, it is called a script. The fundamental building block of a script is called a scriptit. A scriptit is a stand alone element that does not require another scriptit to function. Examples of scriptits include messages, questions, responses, criteria, and tables (to be explained below). An aggregate of scriptits make up a script.

A transaction is the compiled version of a scriptit or group of scripts which is time oriented. That is, all the data for a transaction is sent to handheld 32 at one time. Examples of transactions include messages, questions, responses, scoring criteria, branching conditions or a combination thereof. A group of one or more transactions make up a segment. A segment is a group of transactions that must be played sequentially. For example, a segment may include a transaction asking a question, a transaction disclosing the correct answer, a transaction scoring the viewer's response, a transaction providing the viewer with feedback or a combination thereof. Each transaction is numbered so that the first transaction in a segment is assigned a transaction number of one.

Thus, a script writer designs a script, and the script is compiled and broken down into a series of transactions which are sent to handheld 37. There are several types of scripts which can be designed separately or in combination, for example: standard mode, live events, polling, program or series, mini-games, or pay-per-play. A standard mode script can be either encoded onto a video tape or sent to data insertion 14 to be inserted in the VBI of a television signal in accord with the timing information programmed by the script writer. Live event scripts are to be used with

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live events, for example, sports, news and talk shows. With a live mode script, the script writer has selected text but does not insert timing information into the script. Rather, the script writer just sends a transaction at the appropriate time.

5 A polling script allows an opportunity for viewers to talk back to their television. Polling scripts gather information from the audience, including who they are, where they are and what they like. A polling script is used in conjunction with viewers calling in their scores. Applications include a teaser for news and talk shows. For example, a script could ask questions related to the next episode and then provide the poll results at the beginning of the next show. Or, the polls can be  
10 used as a comparison device, asking viewers questions, then later revealing where their opinions rank in relation to other viewers. It can also be used to rate the programs on a particular network and voice their opinions on what types of programming they would prefer. Finally, it can be used as a source for market research, verifying viewership and audience demographics.

15 Series scripts allows a number of individual games to be grouped into a series. This allows a programmer to devise on-going games in which player's scores can accumulate from game to game with a running tally (cumulative score) stored in handheld 32. An example of a series script is a interactive program designed to be played along with all seven games of the world series.

20 Mini-games are complete games (groups of one or more segments) within a script. Mini-games allows the viewer to play self-contained games within games. For example, a game show may have 3 contests during the program. Each contest could be a mini-game. Mini-games have unique properties and conditions that make them integral and useful parts of scripts, such as not automatically updating the  
25 cumulative score after each transaction or segment. The script writer can choose to update the cumulative score with the mini-game score at the completion of the mini-game, or save the mini-game score to be used for another mini-game. For example. if a script is being developed for a football game, the script writer can choose to report the viewer's scores by quarters. At the end of each quarter, the accumulated  
30 points for the quarter will be posted to the total.

Special programs or series can be designated as pay-per-play events. Interactive programs created for pay-per-play programming are only available to

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viewers who pay pre-registration fees. A special access code given to viewers who pay the fee allows handheld 32 to receive the transactions that are a part of the pay-per-play event. The pay-per-play feature can be used to create high stakes competitions as well as for premier and special events. Such programs utilize the event specific programmer tables, discussed below.

Scripts can be written with different levels of play which can be sent simultaneously to all handhelds 32. This feature allows a programmer to tailor scripts to different skills, ages and interests. Viewers chose their game level and then receive questions only for that level of play.

A script has three main components: messages, questions, and responses. Messages are text displayed on handheld 32 that do not require input from the viewer. Messages can introduce a show or provide information about the program. For example, a message may state, "Hello, welcome to the Super Bowl." Questions are text that request input from the viewer. There are preferably six types of questions: Yes/No, True/False, Multiple Choice, Integer, Decimal, and Fill In The Blank.

Responses are scoring methods and messages, based on an answers entered by a viewer. For example, if the viewer correctly answers a multiple choice question, the viewer could be awarded 25 points and a message would be displayed stating, "Great, you earned 25 points." In the preferred embodiment, there are preferably seven response options from which to choose: Quick and Easy, Multiple Replies, Closest, Count Down, Save Into, Threshold, and In-Range.

Quick and Easy displays one message for a right answer and one message for a wrong answer. Multiple Replies can display a unique message for each answer, with up to seven possibilities. For example, a question may have three acceptable answers, with one of the answers worth more points. The script writer can design a scripit such that a different reply message and point value will be given for each of the three answers. Closest includes one response for answers in a predetermined range and one response for answers out of the range. When scoring an answer for a question using the Closest option, variable points are awarded based on distance from the right answer. The closer a viewer's answer is to the correct answer, the more points the viewer receives. For Count Down, there is one message for the

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right answer and one answer for all others. Variable points are awarded based on the amount of time a viewer takes to input the correct answer. The faster a viewer answers a question, the more points are received.

5 With the Save Into option, no message is displayed for an answer. Rather, the answer is stored in a register for future use. The threshold option awards points and displays a message when the viewer correctly answers a predetermined number of questions. For example, if the viewer is playing along with Jeopardy and guesses 8 out of 10 questions correctly, the viewer will be awarded points. For In Range responses, there is one message for answers within a predetermined range and  
10 another message for answers outside the range. The predetermined range is programmed by the script writer.

Every script is uniquely identified by a combination of three numbers: mailbox number, group number and unit number. This identification structure is one of the features which allows viewers to switch or surf between programs while  
15 ensuring that the handheld 32 maintains the information associated with each interactive program.

An affiliate is the owner and/or producer of a script, who may hire a script writer (or be the script writer) to create a script and who would pay for the air time to broadcast a script. Examples of affiliates include but are not limited to, networks,  
20 advertisers, production companies or sporting event organizers.

Handheld 32 stores scores, opinions and other data in memory units called programmer tables. Each affiliate is assigned a number of programmer tables according to the particular affiliate's needs so that no two affiliates can use the same programmer table. The mailbox number is a unique number assigned to each of the  
25 affiliate's programmer tables. The authoring system 12 only allows an affiliate to create interactive programs which utilize programmer tables assigned to that affiliate.

The group number assigned to a script identifies the group (or series) of scripts to which the script belongs. This number is stored in the programmer table. For many scripts, one episode is its own group; therefore, the group number  
30 assigned to it is unique. However, the interactive system has the capability to combine the scores of a series of scripts. The group number must be the same for

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each script in the series so that handheld 32 knows which series the script belongs to.

The unit number assigned to a script is important when the script is a part of a series. The unit number must uniquely identify each episode of a series, and is stored within the assigned programmer table. When the script is a stand-alone script (e.g. not part of a series) the unit number is usually set to one. Scripts that are a part of a series have the same group number and preferably mailbox number so that scores from the various games in a series can be accumulated in a single register. Alternatively, multiple programmer tables, each with it's individual mailbox number, can be used with the individual scripts or programs of a series such that the score registers (discussed below) of each programmer table is added together. Each script is differentiated from the others in a series by its unique unit number. When a new script is sent on the VBI, handheld 32 checks the assigned programmer table to determine whether the group number from the previous script is the same or different from the current script. If the group number is the same, the handheld 32 will assume that the current script is a part of a series.

Figures 3A-3E are flow charts depicting how the authoring system is used to create a script. Authoring system 12 has a main menu 60 which offers six sub-menus: file menu 62, edit menu 64, script menu 66, system menu 68, window menu 70, and help menu 72.

If a script writer selects the file menu 62, the script writer is given eight options. The script writer can choose to create a "new" file 74, which enables a script writer to create a new script. The script writer can also choose to open an existing script 76. The script writer can save a script 78 if that script has already been saved before. If this is the first time the script writer is saving the script, the script writer would select "save as" 80. Print 82 allows the script writer to print the script file, and print format 84 allows the script writer to print the script file setting the format. Printer setup 86 allows the script writer to select the printer set-up parameters, and exit 88 allows the script writer to exit the authoring system software.

The edit menu 64 allows the script writer to cut 90, copy 92 or paste 94 text. The system menu 68 allows the script writer to enter script information, for example,

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the name of a script and author. The script writer can also define pre-stored messages or pre-stored questions, define defaults and name or re-name any variables or registers. Window menu 70 allows the script writer to view quick buttons 96, which are icons that, when selected, perform functions that normally would take more than one action. Help menu 72 includes information about the authoring system 80 and an index 100 to that information.

Script menu 66, described in more detail in Figure 3B, is chosen when a script writer is creating scripits. The script writer can create a message 102, a question 104, a table 106, a score registration 108, a mini-game 110 or a branching instruction 116. If the script writer chooses to create a message 102, then the script writer is presented with the message window 102 (Figure 3C) which gives the option of creating/modifying a message 118 or leaving the message window 132. If the script writer chooses to create/modify a message 118, the script writer can enter the frame number 120 for the scripit, the name of the message 122, and a description of the message 124. The script writer would then enter a message into text box 126, which would be a window having a blank line. The script writer has the "Send To" option 128 with condition 130 to restrict which viewers will receive the message. For example, the script writer can choose to send the scripit to all viewers who have scored above 700 points or all viewers based on demographic data. If the script writer does not choose any restrictions then every viewer playing along with the script would receive the message.

The script writer has four options when leaving the message window 132. The OK icon 134 saves all of the information that has been entered by the script writer. Alternatively, the script writer can use the cancel icon 136 which returns to the main menu without saving any of the information input by the script writer, or the script writer can delete 138 all information in the message window and return to the main menu 60. The script writer can also choose to select system menu close icon 140, which causes the script writer to exit the authoring system software.

Question window 104 is used when a script writer in the script menu 66 chooses to create a question (Fig. 3D). The script writer has an option to create or modify a question 142 or leave the question window 152. If the script writer chooses to create or modify a question 142, the script writer enters the frame (or

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time code) information 144, the name of the question 146 and a description of the question 148. The script writer then enters a question into the text box 150. The script writer can choose to restrict the viewers who receive the information 162 and 164 (see discussion with regard to icons 128 and 130 in Figure 3C). The script writer can leave the question window 152 by selecting the OK icon 154, cancel icon 156, delete icon 158 or system menu close icon 160 (as described with respect to Figure 3C).

Before leaving the question window, the script writer has the option to set a question characteristic 166 and/or open question response 168.

Setting the question characteristics 166 includes setting the defaults; for example, whether the response typed in by the viewer on handheld 32 should be echoed back, whether any tone should accompany prompts and restricting the amount of time a viewer has to enter a response.

When the script writer chooses the Open Question Response window 168, the script writer is given several alternatives for the response type (Figure 3E). If the script writer chooses Quick and Easy 170, the script writer must enter the correct answer, the points awarded for the correct answer, the reply displayed on handheld 32 if the viewer selects the correct answer and the reply displayed if the viewer selects the wrong answer.

If the script writer chooses Multiple Replies 172, the script writer enters a set of correct answers, the number of points awarded for each correct answer and messages for each of the correct answers.

If the script writer chooses Closest 174, the script writer enters the correct answer, defines the range of answers in which viewers will score points and determines the maximum amount of points to be awarded. The script writer must also input the text to be displayed by handheld 32 when the viewer inputs an answer in the defined range. Handheld 32 uses a predetermined formula for allocating points for answers inside the defined range. For example, if the correct answer is 50, the acceptable range of answers is 30 to 70, and a viewer guesses 40, then the viewer would be off by 50% and would only receive 50% of the maximum allowed points.

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$$\frac{\text{correct answer} - \text{viewer's answer}}{\text{correct answer} - \text{range limit}} \times 100\% = \frac{50-40}{50-30} \times 100\% = 50\%$$

5 Alternatively, scoring could be allocated using a bell curve.

10 If the script writer selects Count Down 176, the script writer enters the correct answer, the maximum number of points possible, the answer time interval and the number of points to decrement per time interval. After the viewer is presented with a question, the clock in handheld 32 begins to run. At every time interval, it subtracts the number of points designated by the script writer from the maximum number of points. For example, if the maximum number of points was 100, the time interval is 5 seconds, the points to subtract per interval is 10 points, and the viewer entered the correct answer in 32 seconds; then the viewer would be  
15 awarded 40 points.

If the script writer chooses Save Into 178, the script writer chooses the register (any one of SAVE1- SAVE7, to be discussed below) which will store the viewer's response.

20 If the script writer chooses Threshold 180, the script writer enters the threshold goal which is the number of correct answers that a viewer must achieve, and the point value for reaching the threshold goal. Additionally, the script writer can enter text to be displayed by handheld 32 informing the viewer whether the threshold was reached.

25 If the script writer chooses In Range 182, the script writer enters the low limit of the range and the high limit of the range of acceptable answers. Additionally, the script writer enters the point value and a message for answering within the range of acceptable answers.

30 Looking back at Figure 3B, another option from the script menu is a table 106. A table is text information, like a message. However, a message is displayed immediately and a table is stored in the memory of handheld 32. A viewer must use a key to get the information in a table. A key is a password learned by answering a correct question, watching a television program, reading a newspaper, or any other incentive an affiliate or advertiser might have. A viewer would enter the



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password into handheld 32 which would trigger the display of the message from the table. The table is likely to include some type of valuable information.

5 The script writer could chose score registration 108, which allows the script writer to send a message to the screen of handheld 32 indicating to the viewer that his or her score has met certain thresholds and that they should call operations 34 to register their score for a prize. The viewer's score may also be stored for long range storage in the memory of handheld 32.

Script menu 66 also allows for branching 116, which is similar to branching in other types of computer programs.

10 From script menu 66 the script writer can select mini-games 110, which allows the script writer to create questions, answers and messages for use in a mini-game (described above).

15 When designing any of the scripits described above, the script writer has the option of entering in the frame number or other timing information to be used for transmitting the corresponding transaction to handheld 32.

20 Once an interactive program is compiled, the object code created must be communicated to data insertion control 14. The means for transmitting object code to data insertion control 14 includes hand carrying by disk, using a computer network with appropriate software, communication over telephone lines, a wire, or authoring system 12 and data insertion control 14 can share the same hardware.

### III. Data Insertion System

25 In the preferred embodiment, data insertion control 14 is a windows application at least partially implemented using a high level programming language; for example, C. The windows application acts as control software for Insertion Card 20. The Insertion Card interface, however, is defined in terms of low level messages along with a framing structure and communications protocol. Thus, device driver 18 is needed to translate between these two environments.

30 Device driver 18 requirements are defined in terms of required functions and general operations. There are four required functions that device driver 18 must perform. First, device driver 18 functions need to be made available to windows applications. This is accomplished by creating a library of linkable C functions.

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Second, interrupt handling routines must be installed to handle the transmit and receive interrupts associated with DMA transfers to and from Insertion Card 20. Third, DMA transfer to and from Insertion Card 20 must be initialized. Fourth, downloadable firmware must be sent to Insertion Card 20.

5           Fig. 4 shows the hardware architecture for Insertion Card 20, which uses standard VBI insertion technology known in the art. It consists of a video processing circuitry, a video signal processor, a control processor, hardware failure detection circuitry and an IBM PC AT bus interface.

10           Composite Video In 228 is first sent to hardware bypass 240. Should the hardware on Insertion Card 20 fail, Insertion Card 20 can be bypassed by properly switching hardware bypass 240 and 282, sending Composite Video In 228 directly to hardware bypass 282 and exiting as Composite Video Out 230. Normally, however, bypass 240 sends signal 228 to video clamp 242.

15           Video processing circuitry is provided on Insertion Card 20 to slice data from the VBI and to insert data into the VBI. The data inserted into the VBI is the transaction data. Insertion Card 20 slices data from the VBI in order to monitor and validate data already existing in the VBI. For example, if a television program has been recorded on a videotape or other recording medium and there is data in the VBI, Insertion Card 20 can slice the data (e.g. read the data) in order to determine  
20           if the data is valid interactive data. If so, the Insertion Card could add a new valid stamp and/or time stamp (discussed below) to the data in order to ensure proper handling by handheld 32.

25           Composite Video In 228 is accepted at the video input and referenced to a known DC signal at video clamp 242. The output of video clamp 242 is sent to three places. The first place, is the data slicing path where the output of video clamp 242 is sent to an Analog to Digital Converter 250 and stored in FIFO 252. Video processor 268 then removes the VBI data from FIFO 252 in a non-real-time manner.

30           The output of video clamp 242 is also presented to a sync separator 244 and sync generator 246 which together extract horizontal and vertical sync information used by video processor 268 for timing purposes. A synchronized composite black video can be created for testing purposes.

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The output of video clamp 242 is also AC coupled and sent to video mux 248. This path is used to allow the television program portion of the signal to pass through Insertion Card 20.

5 Data is inserted into the VBI using both video processor 268 and control processor 266. Two processors are used on Insertion Card 20 to increase performance. Video processor 268 is used to process the data that is inserted into the VBI. Control processor 266 performs all other functions, including sending commands to video processor 268. Thus, RAM 270 can hold slightly more than one transaction of data, while RAM 254 can hold many transactions plus other data. In  
10 the preferred embodiment, the control processor 266 is a Motorola 68HC16 and the video processor is a Texas Instrument TMS 32052. Additionally, control processor 266 has ROM 256 for storing control software.

In communication with control processor 266 is a DMA controller 258 which sends the proper handshaking and control signals to the IBM PC/AT bus interface  
15 264. Data is sent from Insertion Card 20 on the transmit DMA channel from FIFO 262. Data is received from the receive DMA channel into FIFO 260. Via the DMA channel, insertion control 14 controls Insertion Card 20. Insertion control 14 determines when to send data, and what data to send. Insertion control 14 creates all the header information and data formatting (described below). Furthermore,  
20 insertion control 14 is responsible for the manipulating of data; for example, encrypting, interleaving, error codes and other data manipulation.

When data insertion control 14 commands Insertion Card 20 to send data on the VBI, the data is received in FIFO 260 and sent to control processor 266 which can add a valid stamp, and a time stamp based on Real Time Clock (RTC) 267. The  
25 data is then sent to video processor 268 where it is prepared for insertion into the VBI. Video processor 268 uses the sync information from sync separator 244 and sync generator 246 as timing information. The VBI data is then placed in FIFO 274. From FIFO 274 the data is digitized at A/D converter 276 and sent through low pass filter 278, and on to video mux 248.

30 The VBI is only a small portion of the video signal (see discussion below about VBI). Therefore, when data is being inserted into the VBI the video mux is selecting Composite Video for a majority of the time. During the portions of the

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Composite Video that constitute the VBI, video mux 248 selects VBI data, which is the output of low pass filter 278.

5 The control processor 266 is responsible for supporting downloadable code, video signal processor setup, all VBI commands and other general functions. The control processor 266 passes all received messages and formats all outgoing messages. It is also responsible for transaction framing/synchronization, FEC coding, time stamping and validation.

#### IV. Data Transmission

10 Data inserted by Insertion Card 20 must be in a format that conforms to existing television signals. Picture scan for a cathode ray tube television display is generally from left to right and top to bottom consisting of 525 horizontal lines per frame and 30 frames per second. Each frame is divided into two alternating fields: odd field and even field. Referring to Fig. 5, beginning at the upper left-hand corner  
15 of television screen 291 is line 22, followed by line 23, line 24, line 26, ... line 261. This is the odd field. After line 261, the cathode ray beam then travels back to the top of the picture. The period of time while the beam is traveling back to the top of the picture is called the vertical blanking interval (or VBI). This is not an instantaneous bottom to top jump but actually requires the same length of time as 21  
20 lines. These lines (the VBI) are numbered 262 to 282. The even field then begins with the second half of line 284, then line 285 ... line 524. After line 524, the beam then travels back to the top of the picture during the vertical blanking interval. This vertical blanking interval is represented by lines 1-21.

25 Fig. 6 shows a time line 290 for the different lines of information in the video signal. The odd field vertical blanking interval is represented by 290A which includes lines 1-21. Following VBI 290A is odd field 290B consisting of lines 22 through 261. After odd field 290B, the beam travels back to the top of screen 291, during which is the even VBI 290C, lines 262 to 282. After even VBI 290C, the even field of data occurs 290D which includes lines 284 to 525. Each field of data  
30 (e.g. odd or even) and its accompanying VBI is 1/60th of a second.

Odd vertical blanking interval 290A is broken out in Fig. 6 on line 294. The VBI includes vertical sync 294A which occupies lines 1-9, followed by the data lines

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294B which occupy lines 10-21. The vertical sync 294A indicates the beginning of a vertical field, thus, signaling the need for the cathode ray beam to return scan to the upper left hand corner of the screen. Line 12 is broken out in more detail and shown as 300.

5           Any conventional data format for a line of data is acceptable with the understanding that the data may be inserted on blank lines within the vertical blanking interval. One format for data transmitted within the VBI that is both well documented and considered to be reliable is the format chosen for closed captioning. This format transmits a horizontal synchronization pulse 306, a color burst signal  
10       308, a clock run-in signal 310, and a burst of data 302 which is preceded by a start bit 304. The data 302 includes fourteen bits of data and two parity bits. The horizontal sync pulse 306 is included in every line of data to signal the beginning of a line of data or, in other words, signaling a retrace by one line. Color burst 308 provides information needed to decode color. Each burst of data 302 is repeated at  
15       a rate of 16.67 milliseconds (as seen in Figure 7). Data may be inserted on any of the lines of the VBI between line 10 and line 21.

          Fig. 8 shows the structure of the data that is sent on the VBI lines. Data insertion control 14 assembles the data into this format before inserting the data into the VBI. The data consists of a yellow signal 320, a synchronization pattern 322,  
20       header information 324, time stamp 326, transaction parameters 328, and transaction data 330.

          The yellow signal 320 is used to flag the beginning of a framed transaction and is used by Insertion Card 20 to avoid transaction collisions. It currently consists of two words of all 1's.

25           The synchronization pattern 322 is used to synchronize the start of a transaction. The synchronization pattern 322 is currently defined as: 11111001, 10101110, 00000110, 01010001, 10001010, 01100000, 01110101, 10011111.

          Header 324 consists of a source address, destination address, affiliate number, VBI line number and transaction size. The source address is the address  
30       of the device that is generating the original data. The destination address is the address of the type of device that is receiving the data (e.g. handheld 32).

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Time stamp 326 is inserted into the interactive data by Insertion Card 20, at the direction of data insertion control 14, at the time of transmission. The time stamp, which identifies the time that the data was transmitted by the Insertion Card 20, is used to protect against cheating during an interactive program where prizes may be awarded.

Parameters 328 include, but are not limited to, segment number, transaction number, game skill level, a validation stamp, time stamp enable, group number, unit number, mailbox number and other parameters associated with presenting transactions. Time stamp enable toggles the time stamp security system on and off. The validation stamp is used to distinguish valid interactive data from other data.

In order to provide efficient and reliable transmission on the VBI, interactive data can be muxed, FEC coded, interleaved, combined, encrypted and error corrected. The data muxing function packs input items of various bit lengths into an integer number of bytes. Zero fill is used and items are combined most significant bit first. For example, if the source address is Aaaaaaaaaa, the mailbox number is Bbbbbbbbbb and the destination address is Cccc; then byte 1 could be Aaaaaaaaaa, byte 2 could be aaBbbbbbb, and byte 3 could be bbbbCccc.

The FEC coding function accepts an integer number of bytes and outputs an integer number of FEC codewords based on the FEC coding scheme being used. The preferred embodiment uses a rate of three-fourths code with a code word length of 32 bits.

The interleaving function accepts an integer number of FEC code words and outputs an integer number of interleaved blocks. An interleaved block consists of 8 code words where 8 is the interleave factor. Zero fill is used if less than 8 code words are interleaved. For example, the following 8 code words could be interleaved as follows:

```

code word 1: AaaaaaaaaBbbbbbbbCcccccccPppppppp
code word 2: DdddddddEeeeeeeeFfffffffPppppppp
code word 3: GgggggggHhhhhhhhIiiiiiiiPppppppp
code word 4: JjjjjjjKkkkkkkkLlllllllPppppppp
code word 5: MmmmmmmmNnnnnnnnOooooooooPppppppp
code word 6: QqqqqqqqRrrrrrrrSsssssssPppppppp
code word 7: TtttttUuuuuuuuVvvvvvvvPppppppp
code word 8: WwwwwwwXxxxxxxxYyyyyyyyPppppppp.

```

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After interleaving:

5           code word 1: ADGJMQTWadgjmqtwadgjmqtwadgjmqtw  
           code word 2: adgjmqtwadgjmqtwadgjmqtwadgjmqtw  
           code word 3: BEHKNRUXbehknruxbehknruxbehknrux  
           code word 4: behknruxbehknruxbehknruxbehknrux  
           code word 5: CFILOSVYcfilosvycfilosvycfilosvy  
           code word 6: cfilosvycfilosvycfilosvycfilosvy  
 10          code word 7: PPPPPPPpppppppppppppppppppppppp  
           code word 8: ppppppppppppppppppppppppppppppppp

15           The data combining function combines data by appending one input to another. The encryption function accepts an integer number of bytes and outputs an integer number of encrypted blocks. The encrypted block is defined by the specific encryption algorithm being used. Currently, an encryption block is 8 bytes. Zero fill is used.

20           The CRC generation function accepts an integer number of bytes and calculates a 16-bit check word. A CRC algorithm is used to implement the following polynomial:  $x^{16} + x^{12} + x^5 + 1$ . Furthermore, Insertion Card 20 includes a select module (not shown) to determine on which VBI line to send the data.

#### V.     Settop device

25           Data is recovered from the VBI, by settop device 28, at a sample rate of 500,000 bits per second. However, this rate occurs for a short burst during the vertical blanking interval. A specific line of data only occurs every 16.7 milliseconds, thus, the data stream consists of 14 bits clocked at a high rate followed by 16.7 milliseconds of no data. As shown in Fig. 7, the 14 bits are transmitted within 4.7 milliseconds. The purpose of settop device 28 is to recover this data transmitted during the VBI at a high data rate and, using infrared transmission, send  
 30           that information to handheld 32 at a much slower data rate of 4,900 bits per second. This task can be accomplished generally using a buffer or memory device with different clock rates for input and output.

35           Fig. 9 depicts a more detailed representation of settop device 28, which is similar to a conventional decoder for decoding VBI information used, for example, for closed caption applications. Settop device 28 includes a buffer 353 for receiving the video signal and a sync separator 354. This sync separator 354 extracts the

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synchronizing information (H Sync and V Sync: which are the horizontal sync and vertical sync discussed above) from the video signal and sends them to microprocessor 358. The stripped video signal which is the output of sync separator 354, labeled V-signal, is sent to data slicer 356. Data slicer 356 digitizes the signal and sends the digitized signal to microprocessor 358. Connected to microprocessor 358 is ROM and RAM memory unit 360, which is used to store control code and data. Microprocessor 358 is connected to a clock (not shown). The clock includes a divider circuit so that two clock signals are available. The two clock signals have different frequencies which enable the settop device 28 to read data in at one speed and send data out at another speed. Microprocessor 358 is powered by power regulator 368. The output of microprocessor 358 goes to infrared transmitter 364.

In operation, data is received as part of a video signal, sync information is stripped from the video signal and the transaction information is removed from the video signal, by microprocessor 358, using the sync information. Additionally, microprocessor 358 de-interleaves and decodes the data and stores the data in RAM 360. RAM 360 could be any memory device known in the art. The data is then clocked out of RAM 360 at a data rate of 4,900 bits per second where it is sent to IR transmitter 364 and transmitted to handheld 32.

## 20 VI. Handheld

Handheld 32, shown in Figure 10, provides the means for participating in the interactive program. Handheld 32 receives a data stream from settop device 28 and implements/presents the interactive program. The data stream received by handheld 32 includes commands and event specific data.

25 The data stream is received first by an IR detector 380 which senses the infrared signal from settop device 28. The signal received by IR detector 380 is sent to a 44 KHz demodulator 382 which removes the infrared carrier frequency, leaving a serial data stream. The serial data stream is sent to an 8-bit shift register 386 which converts the serial data stream to parallel data for microprocessor 388. The data sent to microprocessor 388 is stored in RAM 390 until a full transaction is received. At that time, microprocessor 388, which communicates with real time



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clock (RTC) 389, builds a sequence of commands and data which are used to present the transaction.

ROM and RAM 390 of microprocessor 388 contain a control program and a command interpreter for the commands sent on the VBI. The RAM portion stores the data and commands transmitted over the IR link. The preferred microprocessor 388 is an embedded processor, on an ASIC, similar to a Rockwell 65C02. In communication with microprocessor 388 is a secure microprocessor 392. The preferred secure microprocessor is Motorola 68HC05SC27. Secured microprocessor 392 allows data to be stored in a tamper proof manner, unaccessible to unauthorized personnel. Handheld 32 further includes a keyboard 394. A buzzer 396 is included to alert the viewer, for example, when the viewer's answer is correct or that handheld 32 is awaiting a response. Handheld 32 further includes an LCD display 398, which is a 4-line by 16-character display. LCD display 398, in the preferred embodiment, shall conform to the features of the Sharp LM24255 (pre-programmed character generator ROM and 8-character generator RAM locations). To extend battery life, the LCD power should be controlled by an I/O bit from the microprocessor 388. Also connected to microprocessor 388 is Infrared Transmitter 393 which communicates with dialer 33.

Handheld 32 is powered by 6-volt battery 400 which is preferably 4 AA cells. There can be an additional lithium cell (not shown) that powers the ROM and RAM 390, and secure microprocessor 392 when loss of main power is detected since these must remain powered at all times. Main power is lost when the 6-volt battery 400 is drained below minimum working voltage or removed entirely.

Figure 11 shows an example of handheld 32. Case 420 is made from molded plastic of a strength and texture suitable for use by viewers in a household environment. Keypad 394 should be molded rubber with carbon contacts that make switch connections against a switch pattern on a printed circuit board. The buttons on keypad 394 could be marked with numbers and/or words. The words could include, but are not limited to "yes", "no", "true", "false", "poor", "fair", "average", "good", "excellent", "info" and "dialer". The "info" button is used to access tables. The "dialer" button is used to communicate with dialer 33. On the front 422 of handheld 32, is a window of red tinted plastic that filters visible light

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and receives infrared data. The IR receive circuitry will be mounted on a PC board behind this windows.

As discussed above, handheld 32 receives all remote data from settop device 28 via an infrared data link. The performance of this link should have a bit-error rate of less than 1-error for every 100,000 bits transmitted (random bit errors) when in the configuration shown in Figure 12. In this configuration, handheld 32 should preferably be within 7.6 meters (25 feet) from the transmitter of settop device 28 and anywhere within plus or minus 60° of the central line of the transmitter.

The features of an interactive program are implemented in part in software resident in handheld 32. This software performs two functions. The first function is to build a transaction from high level commands transmitted via the IR link. The second function is the execution/presentation of the transaction. During the time that a participant is responding to a given transaction, the next transaction is being received and made ready for the participant to process. Using this approach, the amount of information transmitted prior to a viewer being able to use handheld 32 is essentially transparent to the viewer compared to other interactive devices.

Timed responses where the participant must react within a specific time interval can be controlled by either microprocessor 388 in conjunction with real time clock 389, or via a new transaction being sent and activated before the participant enters responses to the prior question.

The interactive system can use encryption algorithms and keys as is known in the trade. Handheld 32 would thus store, for example, three keys at least one of which could be reprogrammed by a signal sent on the VBI.

## VII. Handheld Memory

Figure 13 shows the memory map for microprocessor 388 and secure microprocessor 392. With regard to microprocessor 388, memory location 000-001F (450) is used to map the I/O devices, e.g. keyboard, display, buzzer. Memory locations 0020 - 7FFF (452) is used as RAM to store programmer tables and other data. Locations D800-FFFF (454) is used as ROM.

With respect to the secured microprocessor, memory location 000-001F (456) is used to map the I/O devices. Locations 0020-00FF (458) is RAM. Locations

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0530-10FF (460) is an EEPROM used to store programmer tables. Locations 4000-7FFFF (462) is ROM used to store control information.

5 The interactive system stores data in handheld 32 in registers within programmer tables. Every affiliate has one or more assigned programmer tables so that handheld 32 knows where to store the information specific to that affiliate's interactive program. Additionally, handheld 32 has two universal registers used by all affiliates. One universal register is the Input Register, for temporarily storing viewer's answers to questions. For example, in a multiple choice question, if the viewer enters "4", the Input Register is loaded with a "4". The input register is automatically updated after each question. There is only one input register for each handheld 32. The second universal register is the Points Register, which stores the points earned for entering the correct response to a single question. For example, in a multiple choice question, the correct answer of "4" may earn 25 points. Therefore the value in Points Register would be 25.

15 Fig. 14 is a block diagram of a programmer table. There are fifteen registers per programmer table. Of the fifteen registers, eight have specific functions and seven are general. The eight specific registers are the Mailbox Register 470, Group Register 474, Unit Register 478, Score Register 482, Cume Register 484, Bank Register 500, Segment/Transaction Register 502 and Status Register 504.

20 The Mailbox Register 470 stores the mailbox number. Affiliates can purchase (or be assigned) the exclusive rights to one or more programmer tables. The Group Register 474 stores the group number for the current transaction. The Unit Register 478 stores the unit number for the current transaction. The Segment/Transaction Register 502 stores the segment and transaction number for the current transaction. Status Register 504 holds the status for the current transaction, which includes the cheater bit. Initially, the cheater bit would be reset to zero. If, during the course of an interactive program, the viewer attempts to cheat, the cheater bit would be set to 1. Once the cheater bit is set to 1, the Cume Register 484 is frozen.

30 Score Register 482 stores the score for one program. For example, if the score for one game of a series is 225 points, the Score Register would have 225. Score Register 482 is automatically updated by the value in the Points Register after

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a correct answer is scored. Cume Register 484 stores cumulative scores for a series of programs as identified by the group number. The series may be one or more episodes. Using the example described above with respect to the score register, if the second game score is 275, the cume register could be 500, being the addition of game one (225) and game two (275) of the series. The cume register is automatically updated by the value in the Points Register 480 after every correct answer.

Bank Register 500 stores the accumulated points earned within a mini-game, without updating the Score or Cume Registers. At the end of a mini-game, the script writer has the programming option to add Bank Register 500 to Score Register 483 and Cume Register 484, or to save the contents of Bank Register 500 for later use. For example, the script writer can use the value within Bank Register 500 for another mini-game without adding it to the viewer's Score and Cume Registers. Mailbox Register 470, Affiliate Register 472, Group Register 474, Unit Register 478, Points Register 480, Score Register 482, Cume Register 484, Bank Register 50, Segment/Transaction Register 502 and Status Register 504 are all updated by handheld 32.

Registers Save 1-Save 7 (486, 488, 490, 492, 494, 496, 498), are general purpose registers used by the script writer to store data, for example, input assigned by the programmer with the Save Into response option. These registers can store viewer input for later use or text that a script writer wants to display in a message or question. A script writer may want to ask a question, store a viewer's answers in a register, and then use the stored answer for a branching condition. For example, the interactive program may have a question asking which team will win the game, San Francisco Giants or Atlanta Braves? The script writer could then choose the Save Into response option which causes, for example, a 1 to be stored in Save2 488 if the viewer selected the San Francisco Giants, or a 2 to be stored in Save2 488 if the viewer selected the Atlanta Braves. The script would include a branching instruction so that if Save2 contained a one, the message on handheld display 398 would be "The Giants are great hitters, watch for home runs!" Or, if Save2 contained a 2, the message on display 398 would be, "The Braves have great pitching, watch for a low scoring game!"

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For every question created in the authoring system for which points are awarded to viewers, handheld 32 usually updates at least four registers. The following example, using Figure 15, demonstrates what is stored in various registers after asking a yes/no question. In row 510, a 25 point yes/no question is asked, "Do lions hibernate?" Handheld 32 displays the question and then waits for the viewer to enter an answer. The viewer's input will be stored in the Input Register. If the viewer enters the correct answer, 25 points will be loaded into the Points Register 480. For purposes of this example, this script is the second game of a series (since the first game ended with a score of 500, the Cume Register 484 is equal to the Score Register 482 plus 500) and the viewer's current score is 75 (thus, Score Register 482 = 75 and Cume Register = 575). Row 512 occurs when the viewer enters a 1 representing a yes, which is the wrong answer. Handheld 32 displays the message, "No, lions live in warm climates and have no need to hibernate." Since the wrong answer was selected, no points are earned. Thus, the score and cume registers are not incremented. Row 514 represents when the viewer enters a 2, representing a "no" which is the correct answer; therefore, handheld 32 will display the message, "Right! 25 pts." The Points Register 480 is loaded with 25. The Score Register 482 is then updated by the addition of the Points Register 484. The equation is new Score Register value = old Score Register value plus Points Register. In this case, Score Register = 75 pts. + 25 pts. = 100 pts. The Cume Register 484 is similarly updated by the addition of 25 pts.

In summary, handheld 32 displays a question and then waits for the viewer to enter an answer. The answer is stored in the input register. Handheld 32 then updates the other registers based upon the values stored in the input register. After the registers are updated, new transactions can be presented to the viewer.

Table 1 shows a partial memory allocation for handheld 32. As described above, information is stored in the handheld 32 in programmer tables. There are three types of programmer tables: secured programmer tables, unsecured programmer tables and event specific programmer tables. Unsecured programmer tables have all of the information stored in RAM 390. Secured programmer tables have some of the information stored in RAM 390 and some of the information stored in an EEPROM inside secure microprocessor 392. An event programmer table has

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some information stored in RAM 390 and some information stored in the EEPROM. Secured programmer tables are programmer tables with registers that cannot be accessed or tampered with by a viewer attempting to cheat. When interactive programs award prizes of value, a programmer may want to use a secured programmer table to prevent tampering or cheating. If the game is played without  
5 any incentive for cheating, for example no prizes, an unsecured programmer table could be used.

As described above, programmer tables are assigned to affiliates. For example, they could be sold on a per programmer table basis. Thus, a given affiliate  
10 may buy five or ten programmer tables to use for all of its interactive programs. However, there may be an occasion where an affiliate needs to use to a programmer table for a particular interactive program but has no programmer tables available in its own set of pre-purchased tables. Or, a first time viewer may want to try an interactive program on an incremental basis. Thus, an affiliate can buy an event  
15 programmer table which is a programmer table available only for one particular event. The most useful function for event specific programmer tables is in conjunction with pay-per-play events. For example, a viewer might be given the opportunity to buy the right to participate in a pay-per-play interactive program in conjunction with a pay-per-view boxing match. In this situation, the viewer would  
20 order the pay-per-play event and receive an access code to activate the specific event programmer table, which enables the viewer to participate in the pay-per-play interactive program.

Table 1 shows the preferred maximum number and allocation of the three types of programmer tables with respect to RAM 390 and the EEPROM inside  
25 secure microprocessor 392. The column labeled "EE Bytes" represents bytes of data stored in the EEPROM of secured microprocessor 392. The column labeled "RAM Bytes" represents bytes of data stored in RAM 390. In the preferred embodiment, there are 204 secured programmer tables, there are 182 unsecured programmer tables and 20 event tables.

30 For example, Table 1 shows that there are 204 secured programmer tables, with each programmer table having a Group Register which is 10 bits wide.

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Therefore, 255 bytes of the EEPROM in secured microprocessor 392 are used for secured programmer table Group Registers.

Table 1

	Purpose	Quantity	Size	RAM Bytes	EE Bytes
5	Secured Tables:				
	Group #	204	10 bits		255
	Unit #	204	4 bits		102
	Mailbox #	204	14 bits		357
	Score	204	3 Bytes		612
10	Cume	204	3 Bytes		612
	Save 1-7	204	21 Bytes	4284	
	Bank	204	3 Bytes		612
	Status	204	1 Byte		204
	Seg/Trans	204	3 Bytes	612	
15	Unsecured Tables:				
	Group #	182	10 bits	228	
	Unit #	182	4 bits	91	
	Mailbox #	182	14 bits	319	
	Score	182	3 Bytes	546	
20	Cume	182	3 Bytes	546	
	Save 1-7	182	21 Bytes	3822	
	Bank	182	3 Bytes	546	
	Status	182	1 Byte	182	
	Seg/Trans	182	3 Bytes	546	

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	Event Tables:				
5	Group #	20	10 bits		25
	Unit #	20	4 bits		10
	Mailbox #	20	14 bits		35
	Score	20	3 Bytes		60
	Cume	20	3 Bytes		60
	Save 1-7	20	21 Bytes	420	
	Bank	20	3 Bytes		60
	Status	20	1 Byte		20
10	Seg/Trans	20	3 Bytes	60	

#### VIII. Handheld Sequencing

15           Handheld 32 uses the mailbox number, group number, unit number, segment number, transaction number, time stamp enable and cheater bit in order to ensure that the viewer is playing the transactions in the proper sequence. Sequence is important for two reasons. First, monitoring the sequence of transactions can be used to detect cheating. Second, if for any reason a transaction is missed by

20           handheld 32 (e.g., data loss or a viewer was surfing or grazing) it is desired that handheld 32 not continue processing transactions in that segment. For example, if the question in a sequence of question-answer-scoring is missed, handheld 32 should not wait for the response because the viewer does not know that handheld 32 is waiting for an answer, nor would there be an answer to score. Handheld 32 should

25           remain idle until the start of the next sequence.

          The following examples help describe how handheld 32 sequences through an interactive program and updates the appropriate registers. Most of the examples have two columns followed by an explanation. The left column is certain data associated with a new transaction as compared to the previous transaction. The right

30           column shows the effect that the data in the left column has on a programmer table.



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Example 1

5	Mailbox # . . . . .	Same	Score	=	Updated
	Group # . . . . .	Same	Cume	=	Updated
	Unit # . . . . .	Same	Sav1-Sav7	=	Updated
	. . .		CB	=	Same

10 In this first example, the transaction data is referencing the same Mailbox Number, Affiliate Number, Group Number, and Unit Number as the previous transaction. Therefore, this transaction will use the same programmer table as the previous transaction. The current transaction is the next transaction in the same game as the previous transaction. Thus, the programmer table is maintained and updated accordingly.

15

Example 2

20	Mailbox # . . . . .	Different
	Group # . . . . .	Don't Care
	Unit # . . . . .	Don't Care
	Affiliate # . . . . .	Don't Care
	Segment # . . . . .	Don't Care
	Transaction # . . . . .	Don't Care
25	Time Stamp Enable . . . . .	Don't Care

This transaction has a different Mailbox Number than the previous transaction; therefore, handheld 32 uses a different programmer table.

30 Example 3

	Mailbox # . . . . .	Same	Score	=	0
	Group # . . . . .	Different	Cume	=	0
	Unit # . . . . .	Same	Sav1-Sav7	=	0
			CB	=	0

35

40 In this situation, handheld 32 is using the same programmer table; however, a new interactive program (or series) is starting due to the new group number. Since the new transaction is part of a new series, the Score, Cume, Point and Save Registers are reset to zero and then updated with the scores from the new transaction.

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Example 4

5	Mailbox # . . . . .	Same	Score	= 0
	Group # . . . . .	Different	Cume	= 0
	Unit # . . . . .	Different	Sav1-Sav7	= 0
			CB	= 0

10 As in the previous example, a new program or series is starting that uses the same programmer table as the previous transaction.

Example 5

15	Mailbox # . . . . .	Same	Score	= 0
	Group # . . . . .	Same	Cume	= Updated
	Unit # . . . . .	Different	Sav1-Sav7	= Updated
			CB	= Same

20 This is an example where the new transaction is using the same programmer table and is part of same series as the previous transaction, but has a different unit number. Thus, the new transaction is the next game in the series. For example, it may be a new game in the World Series. Thus, handheld 32 should zero out the Points and Score Registers but maintain the Cume Register.

25 Example 6

30	Mailbox # . . . . .	Same	Score	= Same
	Group # . . . . .	Same	Cume	= Same
	Unit # . . . . .	Same	Sav1-Sav7	= Same
	Segment # . . . . .	Backward Sequence	CB	= Same
	Transaction # . . . . .	!=1		
	Time Stamp Enable . . . . .	True		

35 In this example, the segment number has changed but in backwards sequence. For example, handheld 32 was processing segment 7; however, the new transaction is from segment 5. Since the transaction number is not equal to 1, handheld 32 is receiving this transaction in the middle of a sequence. This may be an example of a viewer who taped a portion of an interactive program and is attempting to replay part of the program. Thus, handheld 32 will ignore this transaction, and wait for the beginning of the next sequence. Ignoring the transaction includes not presenting the

40

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transaction and not updating any programmer tables. Therefore, the programmer table will not be updated with the new sequence number; thus, the next transaction received by handheld 32 is also likely to be out of sequence. The next transaction with a transaction number of 1 is likely to be analogous to Example 8.

5

Example 7

	Mailbox # . . . . .	Same	Cume	=	Frozen
	Group # . . . . .	Same	Score	=	0
10	Unit # . . . . .	Same	Sav1-Sav7	=	Updated
	Segment # . . . . .	Backward Sequence	CB	=	1
	Transaction # . . . . .	1			
	Time Stamp Enable . . . . .	True			

15 This situation is similar to the previous example except the transaction number is 1. Therefore, handheld 32 would conclude that the transaction is at the beginning of a segment and the segment is out of order. Handheld 32 assumes that the viewer is cheating by taping the interactive program and replaying it. Therefore, the cheater bit is set to 1 which freezes the Cume Register 484. Points Register 480  
20 and Score Register 482 are reset to zero. The transaction is played without effecting the cumulative score.

Example 8

25	Mailbox # . . . . .	Same	Score	=	0
	Group # . . . . .	Same	Cume	=	0
	Unit # . . . . .	Same	Sav1-Sav7	=	0
	Segment # . . . . .	Backward Sequence	CB	=	0
	Transaction # . . . . .	1			
30	Time Stamp Enable . . . . .	False			

35 This situation is the same as the previous situation, however, the time stamp enable is false. Therefore, even though the viewer is playing out of sequence, Cume Register 484 will not be frozen. Rather, handheld 32 resets the registers and allows the viewer to restart the game. This situation would arise in a children's video or another interactive program where prizes are not awarded and/or cheating is not relevant.

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Example 9

	Mailbox # . . . . .	Same	Score	=	Same
	Group # . . . . .	Same	Cume	=	Same
	Unit # . . . . .	Same	Sav1-Sav7	=	Same
5	Segment # . . . . .	Fwd. out of seq.	CB	=	Same
	Transaction # . . . . .	!=1			
	Time Stamp Enable . . . . .	True			

In this situation, the segment number is out of order, and the new transaction is not the first transaction of the segment. Therefore, the viewer is trying to play a segment by entering in the middle of the segment. This transaction may be a response; however, no question was queried to the viewer. Handheld 32 does not present this transaction to the viewer. Handheld 32 will remain idle (from the viewer's point of view) until the beginning of the next segment, where handheld 32 will start presenting transactions to the viewer (see Example 11). This may be the situation where the viewer was initially participating in the interactive game, but temporarily stopped. Perhaps the viewer momentarily changed television channels or stepped away from the television viewing area (e.g. bathroom break). Although the viewer can continue participating, the viewer loses out by losing the potential scoring from the missed transactions.

Example 10

	Mailbox # . . . . .	Same	Score	=	Updated
25	Group # . . . . .	Same	Cume	=	Updated
	Unit # . . . . .	Same	Sav1-Sav7	=	Updated
	Segment # . . . . .	Fwd. out of seq.	CB	=	Same
	Transaction # . . . . .	1			
30	Time Stamp Enable . . . . .	True			

This situation is similar to Example 10 except that the transaction number is 1. Therefore, the viewer has missed some transactions and is now at the beginning of a new segment. Since the transaction is at the beginning of a segment, handheld 32 allows the viewer to play the transaction and, appropriately updates the Score and Cume Registers. As in Example 10, the viewer does not receive any scoring from the missed transactions.

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Example 11

	Mailbox # . . . . .	Same	Score	=	Updated
	Group # . . . . .	Same	Cume	=	Updated
5	Unit # . . . . .	Same	Sav1-Sav7	=	Updated
	Segment # . . . . .	Same	CB	=	Same
	Transaction # . . . . .	In sequence			
	Time Stamp Enable . . . . .	True or False			

10            This situation is the norm. The viewer is playing the next transaction in the same segment and all the registers are appropriately updated.

Example 12

15	Mailbox # . . . . .	Same	Score	=	Same
	Group # . . . . .	Same	Cume	=	Same
	Unit # . . . . .	Same	Sav1-Sav7	=	Same
	Segment # . . . . .	Same	CB	=	Same
	Transaction # . . . . .	Bck. seq. !=1			
20	Time Stamp Enable . . . . .	True			

25            In this situation, the transaction has same segment number but a lower transaction number which is not equal to 1. For example, the previous transaction had a transaction number of 6; however, the current transaction has a transaction number of 4. The viewer most likely attempted to replay a taped transaction. The transaction is ignored. Handheld 32 may start presenting transactions when it receives a transaction with a transaction number of one. Until that time, the registers will not be updated.

30    Example 13

	Mailbox # . . . . .	Same	Score	=	0
	Group # . . . . .	Same	Cume	=	Frozen
	Unit # . . . . .	Same	Sav1-Sav7	=	Updated
35	Segment # . . . . .	Same	CB	=	1
	Transaction # . . . . .	Bck. seq. =1			
	Time Stamp Enable . . . . .	True			

40            This is the same situation as the previous example except that when the viewer rewound the tape (assuming the viewer videotaped), the tape was rewound to the beginning of the sequence. Thus, the transaction number is 1. Handheld 32

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assumes the viewer is trying to cheat; therefore, handheld 32 resets the Score and Points Registers, freezes the Cume Register and sets the cheater bit to 1. The viewer can continue to play the interactive program and update the resetted Score Register, but the viewer's score does not count toward a prize. Because the Cheater Bit (CB) is set to one, the Cume Register is frozen and the viewer would not receive a message to register the viewer's score with operations 34.

Example 14

10	Mailbox # . . . . .	Same	Score	=	0
	Group # . . . . .	Same	Cume	=	0
	Unit # . . . . .	Same	Sav1-Sav7	=	0
	Segment # . . . . .	Same	CB	=	0
	Transaction # . . . . .	Bck. seq. =1			
15	Time Stamp Enable . . . . .	False			

This situation is the same as the situation in example 12, however time stamp enable is set to false. Thus, handheld 32 does not care that the viewer may be cheating. A new game is started.

20

Example 15

	Mailbox # . . . . .	Same	Score	=	Updated
	Group # . . . . .	Same	Cume	=	Updated
25	Unit # . . . . .	Same	Sav1-Sav7	=	Updated
	Segment # . . . . .	Same	CB	=	Same
	Transaction # . . . . .	Fwd. out of seq.			
	Time Stamp Enable . . . . .	True or False			

30

In this situation the viewer is playing the interactive program out of sequence. The viewer may have taped and is jumping ahead, the viewer may have switched channels (surfing) and now has come back, or the viewer may have momentarily left the television viewing area and missed a transaction. Since handheld 32 knows it is playing a transaction out of sequence within the same segment, the handheld merely ignores the transaction and waits for a new transaction with a transaction number of 1. The registers are not updated.

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Example 16

	Mailbox # . . . . .	Same	Score	=	Same
	Group # . . . . .	Same	Cume	=	Same
5	Unit # . . . . .	Same	Sav1-Sav7	=	Same
	Segment # . . . . .	Same	CB	=	1
	Transaction # . . . . .	Same			
	Time Stamp Enable . . . . .	True or False			

10           In this situation the viewer is attempting to replay the exact same transaction again. Handheld 32 simply ignores the transaction. The cheater bit is set to one because the viewer is attempting to cheat.

15           It follows from the above description that, even with interleaved games and the viewer's entering and leaving the interactive program at various times, the viewer's reactions and answers to all games in which the viewer participates are stored in some form by handheld 32 and later can be reported to a central processing station (operations 34).

Other objects, aspects and advantages of the invention can be obtained from a view of the claims and the appended figures.

20           It is to be understood that other embodiments of the present invention can be constructed and be within the spirit and scope of the present invention.

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CLAIMS

What is claimed is:

- 1           1. An interactive television system, comprising:  
2           a receiver for receiving interactive data;  
3           a processor, in communication with the receiver, for processing the  
4           interactive data and presenting transactions based on the interactive data; and  
5           memory, in communication with the processor, for storing data, the memory  
6           including a plurality of programmer tables.
- 7           2. An interactive television system according to claim 1, wherein  
8           each programmer table includes a unique dentification number, a game score  
9           register, and a cumulative score register.
- 10          3. An interactive television system according to claim 1, wherein the  
11          plurality of programmer tables includes an event specific programmer table, a  
12          secured programmer table and an unsecured programmer table.
- 13          4. An interactive television system according to claim 1, further including:  
14          a display in communication with the processor; and  
15          a keyboard in communication with the processor.
5. An interactive television system according to claim 1, further including  
            a secured processor.
6. An interactive television system according to claim 1, further including:  
1           a dialer for communication between the processor and a remote location.
- 2           7. An interactive television system according to claim 6, wherein the dialer  
3           includes a modem.



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4           8. An interactive television system according to claim 6, wherein the dialer  
5           wherein the dialer communicates with the processor via infrared communication.

6           9. An interactive television system according to claim 1, wherein said  
7           receiver receives infrared data and translates the infrared data to a format acceptable  
8           to the processor.

1           10. An interactive television system according to claim 1, further including  
2           a settop device for receiving a television signal and reading the interactive data from  
3           the vertical blanking interval of the television signal.

1           11. An interactive television system according to claim 10, wherein the  
2           settop includes an infrared transmitter for transmitting the interactive data; and  
3           the receiver includes an infrared receiver for receiving the interactive data.

1           12. An interactive television system according to claim 1, further including  
2           an insertion system for inserting interactive data on to an existing television signal.

1           13. An interactive television system according to claim 12, wherein the  
2           insertion system inserts the interactive data on the vertical blanking interval of the  
3           existing television signal.

1           14. An interactive television system according to claim 12, wherein the  
2           insertion system comprises:  
3           a vbi card, for inserting data on the vertical blanking interval of the existing  
4           television signal;  
5           a controller for directing the vbi card; and  
6           an interface between the controller and the vbi card.

1           15. An interactive television system according to claim 12, wherein the  
2           insertion system comprises:  
3           timing means for reading timing information from a television signal;

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4           a video processor, in communication with the timing means;  
5           a memory element, in communication with the processor, for storing data to  
6 be inserted in the vertical blanking interval of the television signal;  
7           a video multiplexer, in communication with the memory element, the timing  
8 means and the television signal, for selectively outputting either the television signal  
9 or the data stored in the memory element.

1           16. An interactive television system according to claim 1, further including:  
2           an authoring system for creating interactive data;  
3           a data insertion; and  
4           a settop device, at the remote station, for receiving the transmitted interactive  
5 data.

1           17. An interactive presentation system comprising:  
2           means for receiving at a remote location interactive data in association with  
3 a presentation of an event, the interactive data including commands and event  
4 specific data;  
5           storage means, having a plurality of programmer tables, for storing data, the  
6 plurality of programmer tables including a secured programmer table, an unsecured  
7 programmer table and an event programmer table;  
8           means, responsive to the commands and the storage means, for presenting  
9 a viewer with a transaction; and  
10          means for updating the storage means based on the commands and the event  
11 specific data.

1           18. A system according to claim 17, wherein each programmer table has a  
2 unique identification number that can be assigned to an entity so that only interactive  
3 data designated by the entity can be used to update the programmer table.

1           19. A system according to claim 17, wherein each programmer table  
2 includes a plurality of registers.

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1           20. A system according to claim 17, further including a first processor and  
2           a second processor, the second processor being a secured processor.

1           21. An interactive presentation system comprising:  
2           a receiver for receiving at a remote location interactive data in association  
3           with a presentation of an event, the interactive data including commands and event  
4           specific data;  
5           a processor in communication with the receiver, so that the commands direct  
6           the microprocessor to present a viewer with an interactive program, the interactive  
7           program using the event specific data;  
8           a memory element, in communication with the microprocessor, the memory  
9           element including a plurality of programmer tables, each programmer table having  
10          a unique identification number;  
11          a keypad, in communication with the microprocessor so that information may  
12          be input by a viewer.

1           22. A system according to claim 21, further including a display.

1           23. A system according to claim 21, wherein the plurality of programmer  
2           tables including a secured programmer table, an unsecured programmer table and an  
3           event programmer table,

1           24. A system according to claim 21, wherein each programmer table  
2           identification number can be assigned to an entity so that only interactive data  
3           designated by the entity can be used to update the programmer table.

1           25. A method for presenting interactive programs on an interactive system  
2           such that a plurality of interactive programs can be interleaved, the interactive system  
3           including a remote terminal for presenting the interactive programs, the remote  
4           terminal having a memory unit, the method comprising the steps of:  
5           dividing a portion of the memory unit in the remote terminals into a plurality  
6           of programmer tables;

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7            assigning a first identification code to a first programmer table;  
8            assigning a second identification code to a second programmer table, the  
9            second identification code being different from the first identification code;  
10           constructing first interactive data, the first interactive data including first  
11           commands and first event specific data, the first interactive data containing a  
12           reference to the first identification number;  
13           constructing second interactive data, the second interactive data including  
14           second commands and second event specific data, the second interactive data  
15           containing a reference to the second identification number;  
16           sending the first interactive data and the second interactive data to a remote  
17           location during the same time period;  
18           receiving the first interactive data and the second interactive data at the  
19           remote location;  
20           providing the ability to selectively tune, at the remote location, either the first  
21           interactive data or the second interactive data;  
22           presenting the viewer with a transaction, at the remote location, based on the  
23           selectively tuned interactive data; and  
24           updating the programmer table referenced by the selectively tuned interactive  
25           data.

1           26. A method according to claim 25, further including the steps of:  
2           providing the ability to change the previous selective tuning, at the remote  
3           location, to tune interactive data not initially selected;  
4           presenting the viewer with a transaction, at the remote location, based on the  
5           newly tuned interactive data; and  
6           updating the programmer table referenced by the newly tuned interactive  
7           data.

1           27. A method according to claim 25, further including the steps of:  
2           assigning the first identification code to a first entity; and  
3           assigning the second identification code to a second entity;

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4           the first interactive data is constructed by the first creator and the second  
5           interactive data is constructed by the second creator.

1           28. An interactive presentation system comprising:

2           a receiver for receiving interactive data such that when a viewer chooses to  
3           participate in a first event the received interactive data includes a first set of  
4           commands and first event specific data, and when the viewer chooses to participate  
5           in a second event the received interactive data includes a second set of commands  
6           and second event specific data;

7           a first processor for presenting transactions to a viewer based on the received  
8           interactive data so that when the interactive data includes the first commands and  
9           first event specific data transactions are presented in association with the first event  
10          and when the interactive data includes the second commands and second event  
11          specific data transactions are presented in association with the second event;

12          a memory unit including a plurality of programmer tables, in communication  
13          with the presentation means, for storing data in an appropriate one of said  
14          programmer tables so that when the received interactive data includes the first set of  
15          commands and first event specific data the appropriate programmer table is the first  
16          programmer table, and when the interactive data includes the second set of  
17          commands and the second event specific data the appropriate programmer table is  
18          the second programmer table, so that (1) the viewer can change between the first  
19          event and the second event throughout the first event and the second event, thereby  
20          interleaving the first event with the second event and interleaving the transactions  
21          presented in association with the first event with the transactions presented in  
22          association with the second event and (2) when the viewer chooses to participate in  
23          the first event the second programmer table is not effected and when the viewer  
24          chooses to participate in the second event the first programmer table is not effected.

1           29. A system according to claim 28, wherein the first programmer table  
2           includes:

3           a register for storing game points;

4           a register for storing cumulative series points; and

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5           a register for storing sequencing information.

1           30. A system according to claim 28, further including a second processor  
2           for maintaining secure data.

1           31. A system according to claim 28, further including a keyboard and a  
2           display.

1           32. A system according to claim 28, further including a command interpreter  
2           for interpreting the first set of commands.

1           33. An interactive presentation system comprising:  
2           a receiver for receiving during a first time interval first interactive data  
3           including first commands and first event specific data associated with a first event  
4           and during a second time interval second interactive data including second commands  
5           and second event specific data associated with a second event;  
6           a processor for presenting first transactions to a viewer during the first time  
7           interval based on the first interactive data and for presenting second transactions to  
8           a viewer during the second time interval based on the second interactive data;  
9           a memory unit, in communication with the presentation means, including a  
10          first programmer table storing first transaction data associated with the first event and  
11          a second programmer table storing second transaction data associated with the second  
12          event, so that presenting transactions to a viewer based on the first interactive data  
13          does not effect the second programmer table and presenting transactions to a viewer  
14          based on the second interactive data does not effect the first programmer table.

1           34. A system according to claim 33, further including a keyboard and a  
2           display.

1           35. A system according to claim 33, wherein the first and second time  
2           intervals do not overlap.

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1           36. A system according to claim 33, wherein the first and second time  
2 intervals overlap.

1           37. A method for receiving and presenting interactive programs on an  
2 interactive system, the interactive system including a memory unit, the memory unit  
3 including a first programmer table having a first identification code and a second  
4 programmer table having a second identification code different from the first  
5 identification code, the method comprising the steps of:

6           (a) receiving first interactive data, the first interactive data including  
7 commands and event specific data, the first interactive data containing a reference  
8 to the first identification code;

9           (b) presenting the viewer with a transaction based on the first interactive data  
10 without erasing the second programmer table;

11           (c) updating the first programmer table based on step (b) without erasing the  
12 second programmer table;

13           (d) receiving second interactive data, the second interactive data including  
14 commands and event specific data, the second interactive data containing a reference  
15 to the second identification code; . . . . .

16           (e) presenting the viewer with a transaction based on the second interactive  
17 data without erasing the first programmer table; and

18           (f) updating the second programmer table based on step (e) without erasing  
19 the first programmer table.

1           38. A method according to claim 37, further including the steps of

2           (g) receiving third interactive data, the third interactive data including  
3 commands and event specific data, the third interactive data containing a reference  
4 to the first identification number; . . . . .

5           (h) presenting the viewer with a transaction based on the third interactive data  
6 without erasing the second programmer table; and

7           (i) updating the first programmer table based on step (h) without erasing the  
8 second programmer table.

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1           39. A system for creating an interactive program for presentation on a  
2 remote terminal, the remote terminal including a memory unit, the memory unit  
3 including a plurality of programmer tables, the system comprising:  
4           means for choosing a programmer table from the plurality of programmer  
5 tables;  
6           means for creating a script including:  
7           means for selecting a message,  
8           means for selecting a question,  
9           means for selecting an appropriate response, and  
10          means for selecting response criteria; and  
11          means for compiling the script to create interactive data so that presenting an  
12 interactive program based on the interactive data will utilize the chosen programmer  
13 table.

1           40. A system according to claim 39, further including means for creating a  
2 live script and for creating a script having timing information.

1           41. A system according to claim 39, further including means for assigning  
2 a subset of the plurality of programmer tables to an entity, and wherein said means  
3 for choosing restricts the programmers choice of programmer tables to the subset of  
4 the plurality of programmer tables.

1           42. A system according to claim 39, further including:  
2           means for validating and invalidating the interactive data; and  
3           means for transmitting the interactive data to a remote location only if the  
4 interactive data is valid.

1           43. A method for making an interactive video program for presentation on  
2 a remote interactive system, the interactive system including a memory unit, the  
3 memory unit including a first programmer table having a first identification code and  
4 a second programmer table having a second identification code different from the  
5 first identification code, the method comprising the steps of:



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6           creating a first script;  
7           compiling the first script to create first interactive data, the first interactive  
8           data including first commands and first event specific data, the first interactive data  
9           containing a reference to the first identification code;  
10          sending the first interactive data to the remote interactive system for  
11          presentation of a first transaction to a viewer based on the first interactive data  
12          without erasing the second programmer table;  
13          creating a second script;  
14          compiling the second script to create second interactive data, the second  
15          interactive data including second commands and second event specific data, the  
16          second interactive data containing a reference to the second identification code; and  
17          sending the second interactive data to the remote interactive system for  
18          presentation of a second transaction to a viewer based on the second interactive data  
19          without erasing the first programmer table.

1           44. A method for making an interactive video program according to claim  
2           43, further including the steps of:

3           creating a third script;  
4           compiling the third script to create third interactive data, the third interactive  
5           data including commands and event specific data, the third interactive data containing  
6           a reference to the first identification code;  
7           sending the third interactive data to the remote interactive system for  
8           presentation of a third transaction to a viewer based on the third interactive data  
9           without erasing the second programmer table.

1           45. A method for making an interactive video program according to claim  
2           43, wherein the step of creating a first script includes the steps of:

3           selecting a question,  
4           selecting an appropriate response, and  
5           selecting response criteria; and  
6           compiling the script.

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1           46. A system for presenting interactive video programs, comprising:  
2           an authoring system for creating interactive data having timing information;  
3           timed insertion means for inserting the interactive data into a video signal  
4           according to the timing information;  
5           means for storing the interactive data;  
6           live insertion means for real time insertion of the stored interactive data into  
7           the video signal; and  
8           operator insertion means for inserting the stored interactive data into the  
9           video signal at the direction of an operator.

1           47. A system according to claim 46, wherein the timed insertion means  
2           inserts the interactive data into a specific video frame indicated by the timing  
3           information.

1           48. A system according to claim 46, wherein the timed insertion means, the  
2           live insertion means and the operator insertion means insert the interactive data into  
3           a vertical blanking interval of the video signal.

1           49. A system according to claim 46, wherein the timed insertion means  
2           inserts the interactive data at a specific time interval in relation to a frame number.

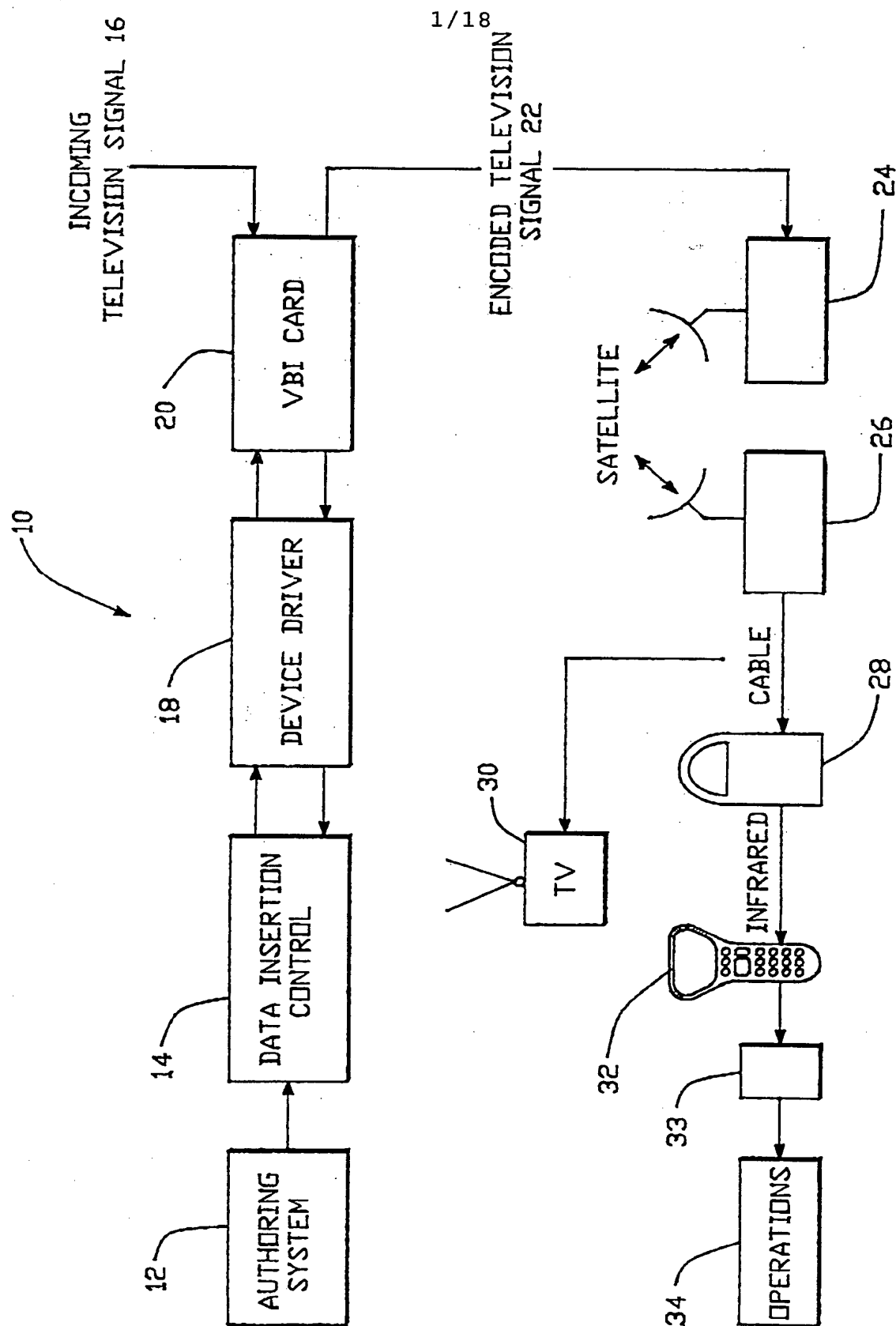


FIG. 1

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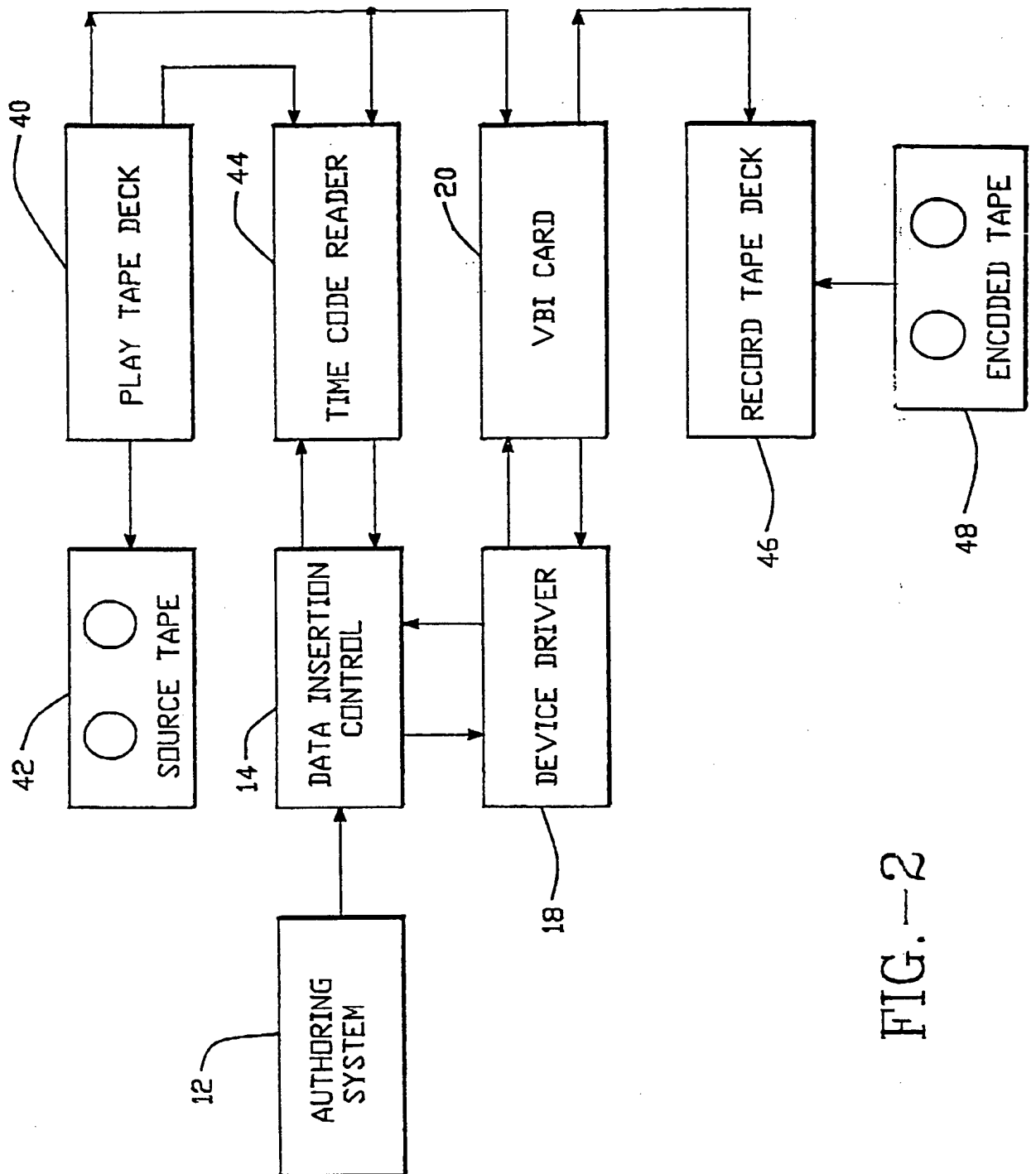


FIG. -2

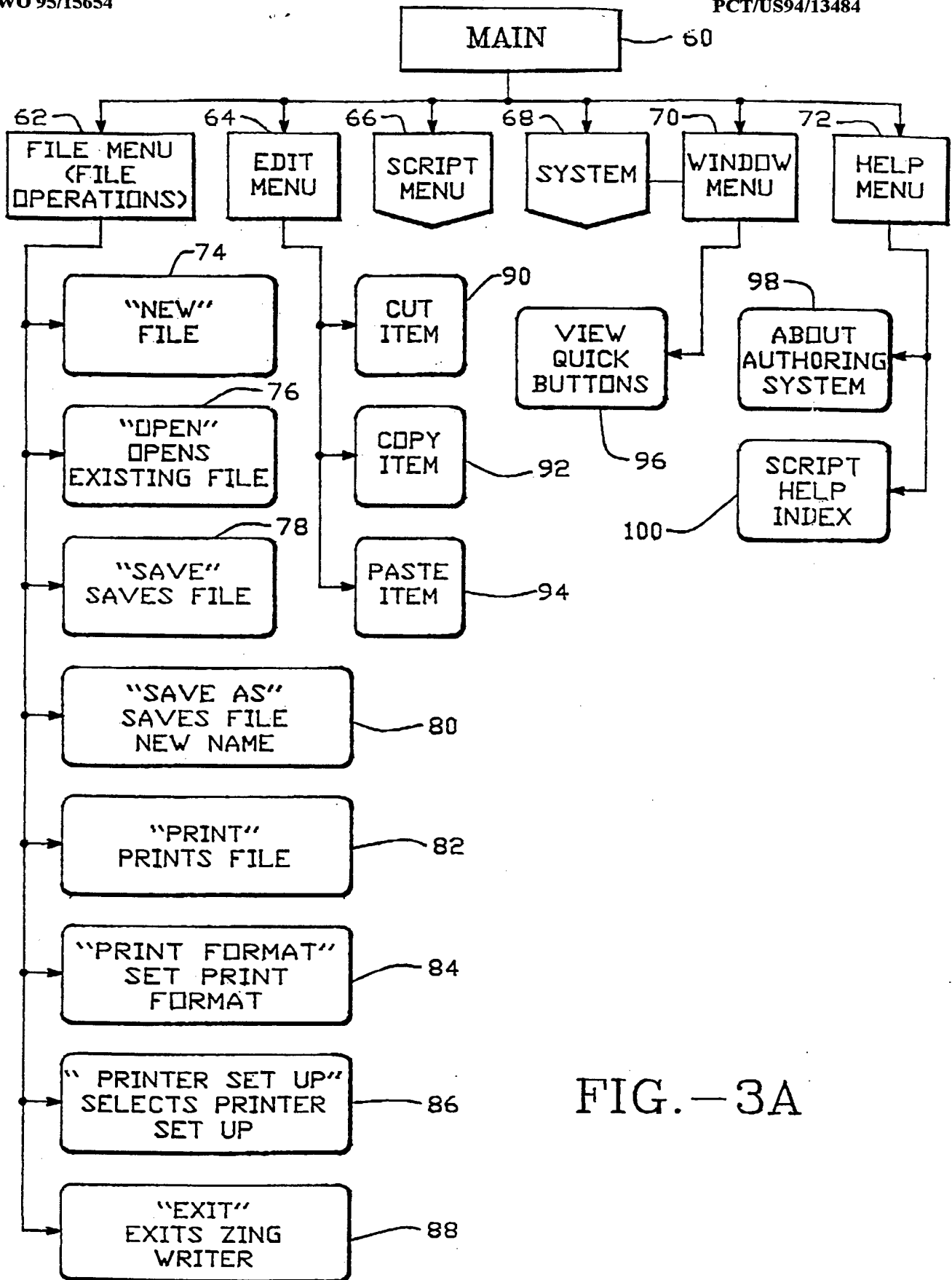


FIG.—3A

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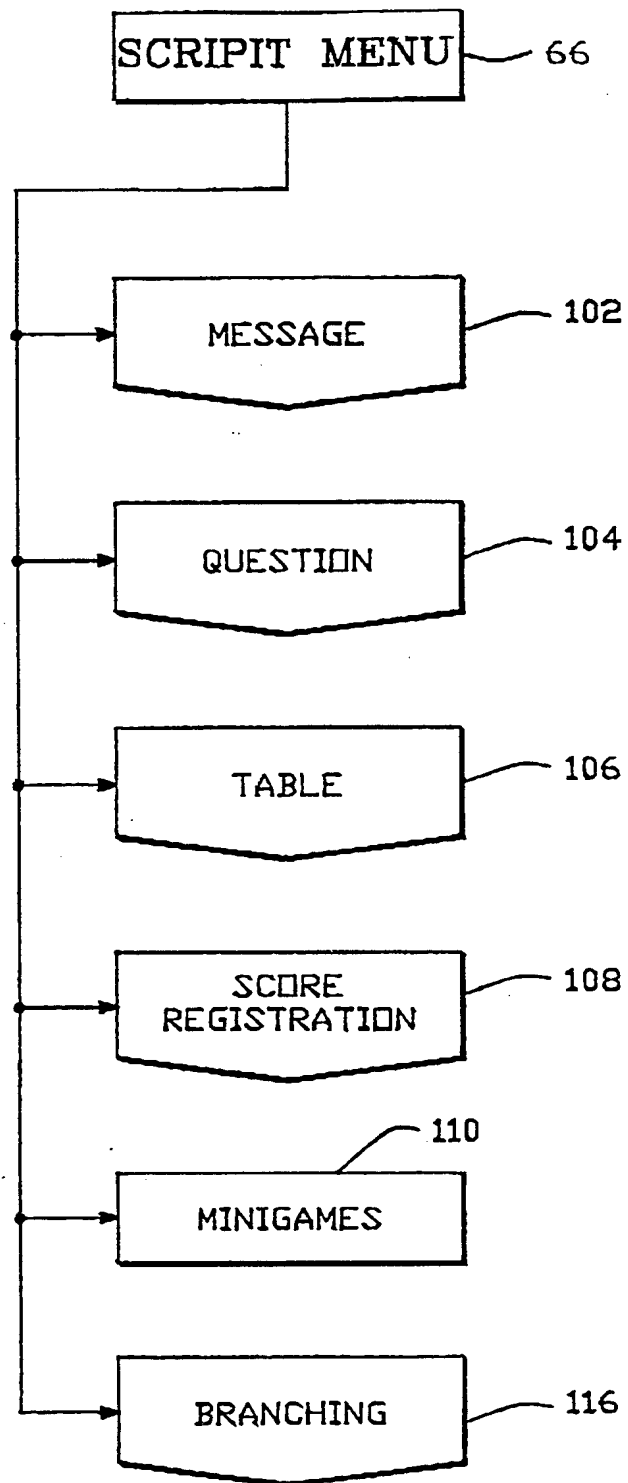


FIG.—3B

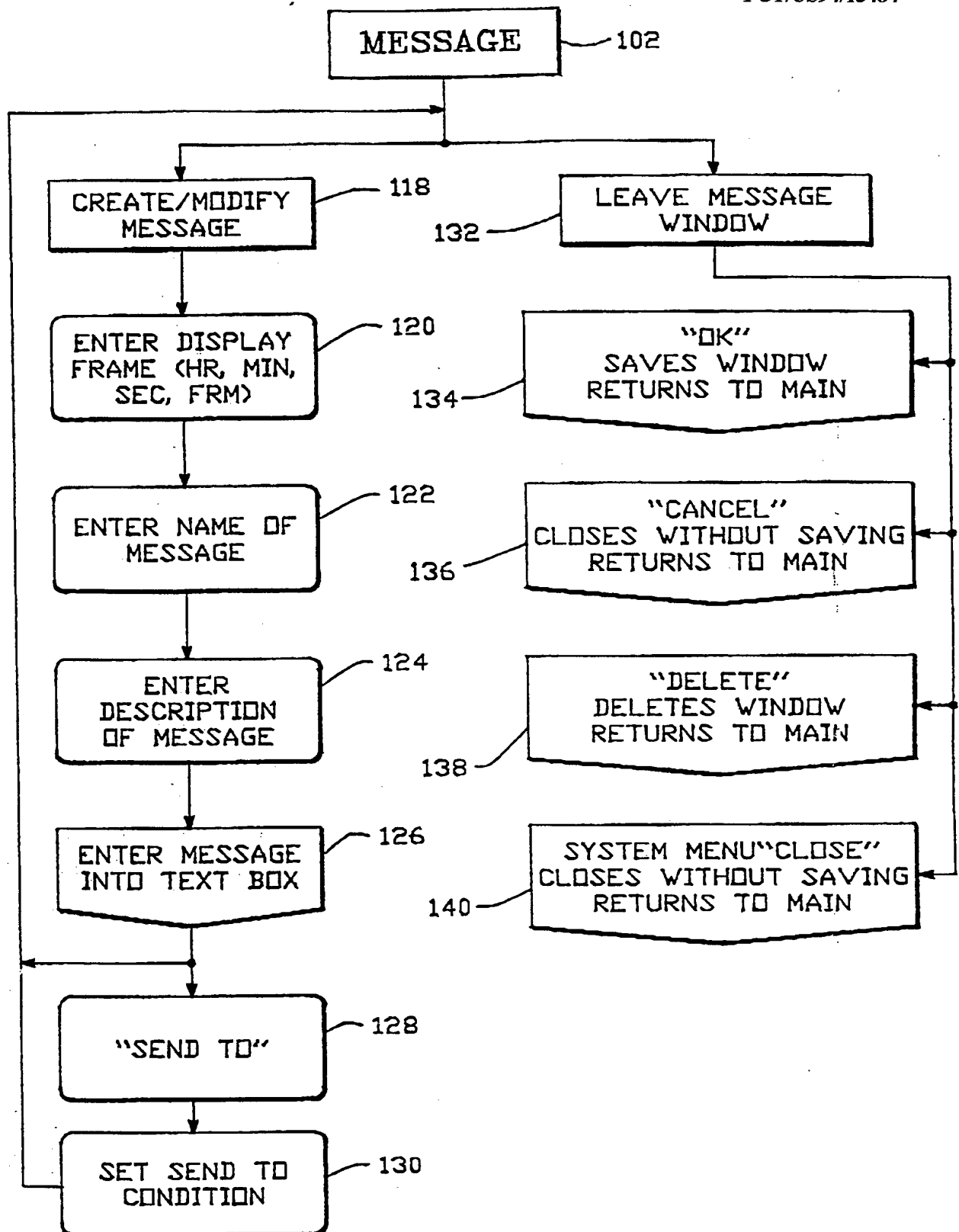


FIG. -3C

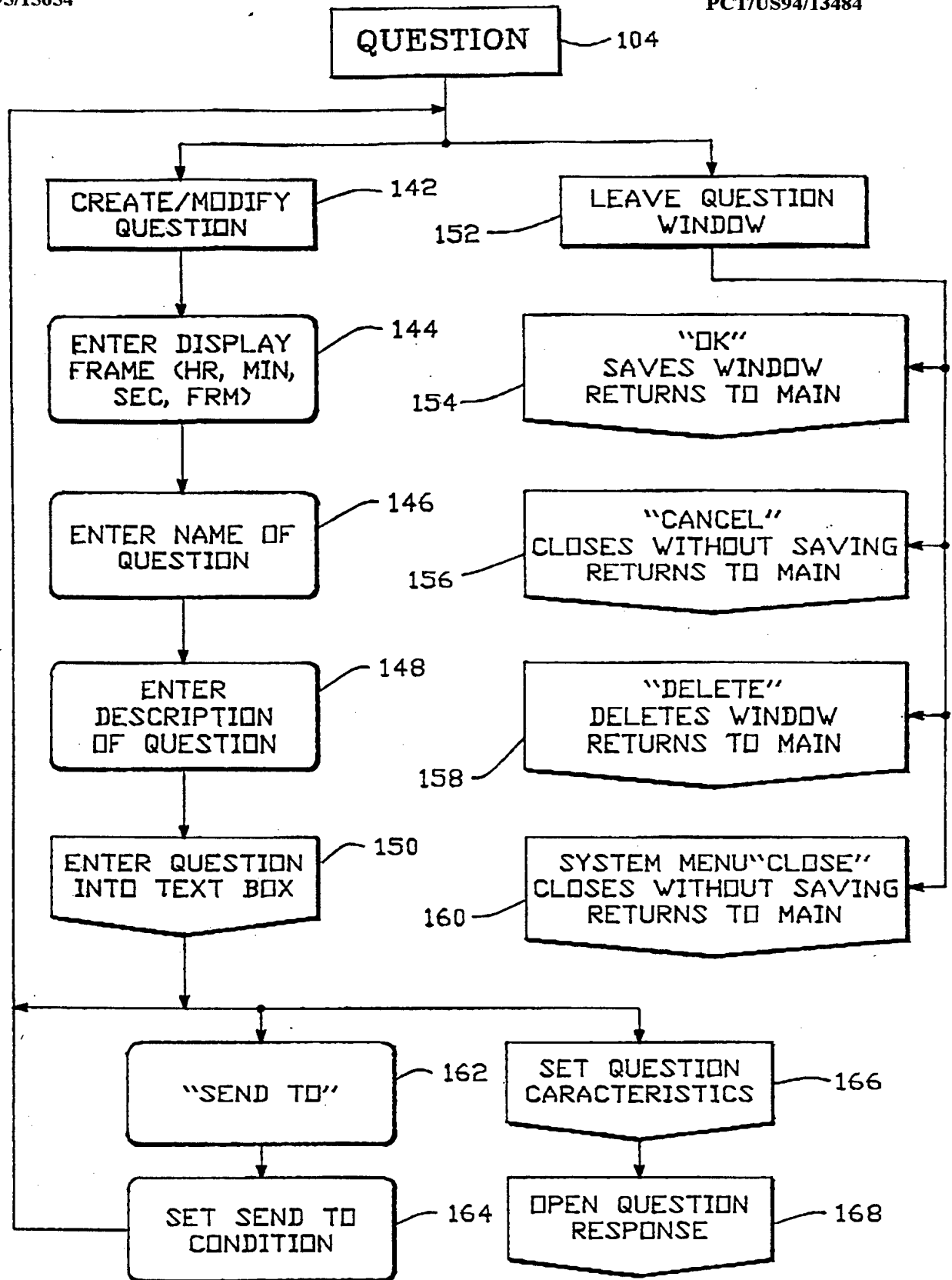


FIG.—3D



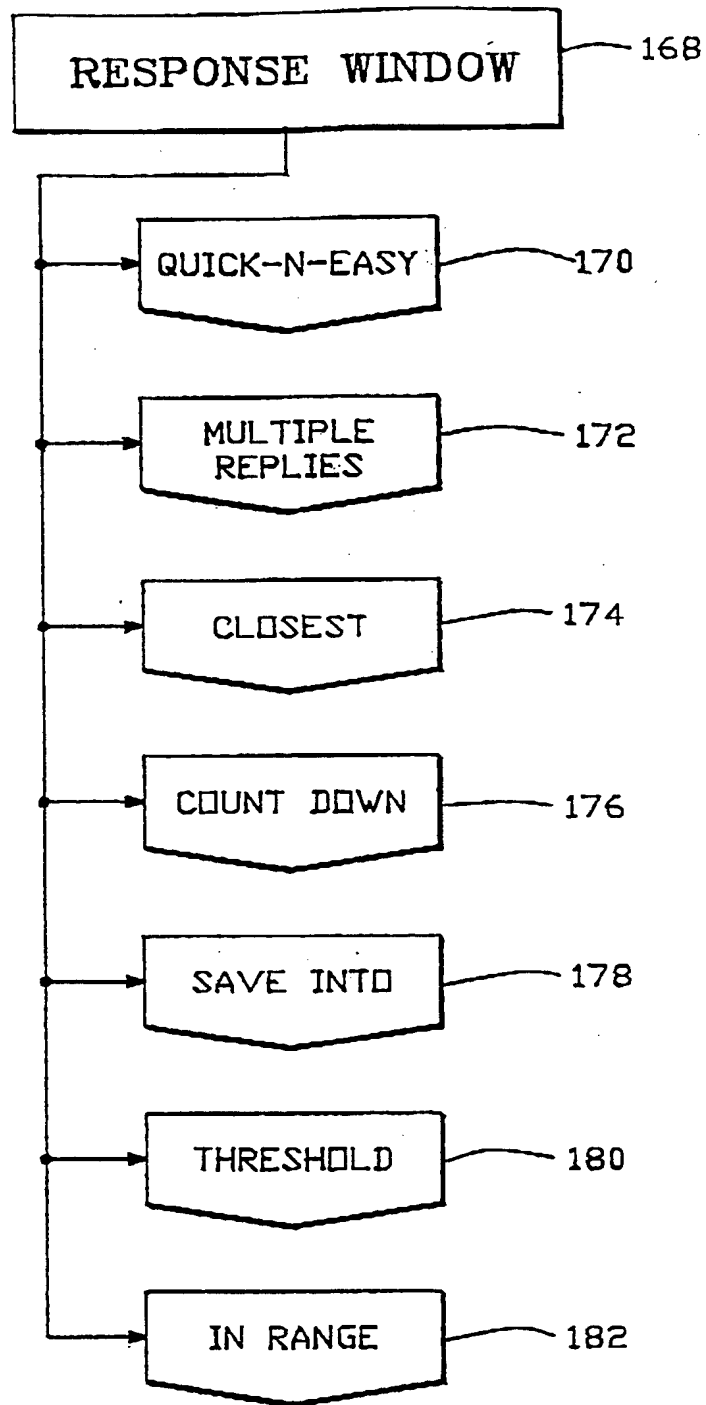


FIG.—3E

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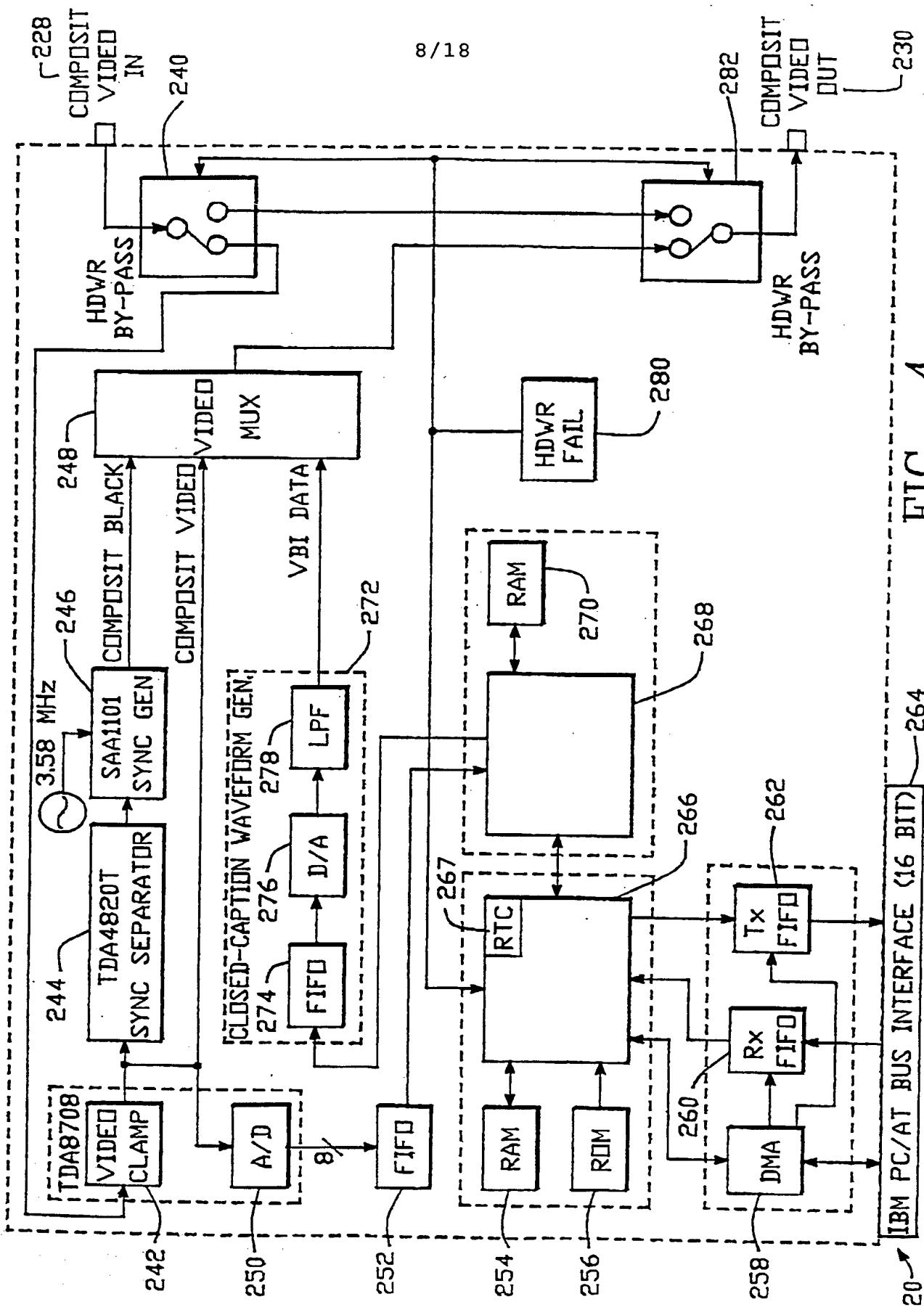


FIG. 4

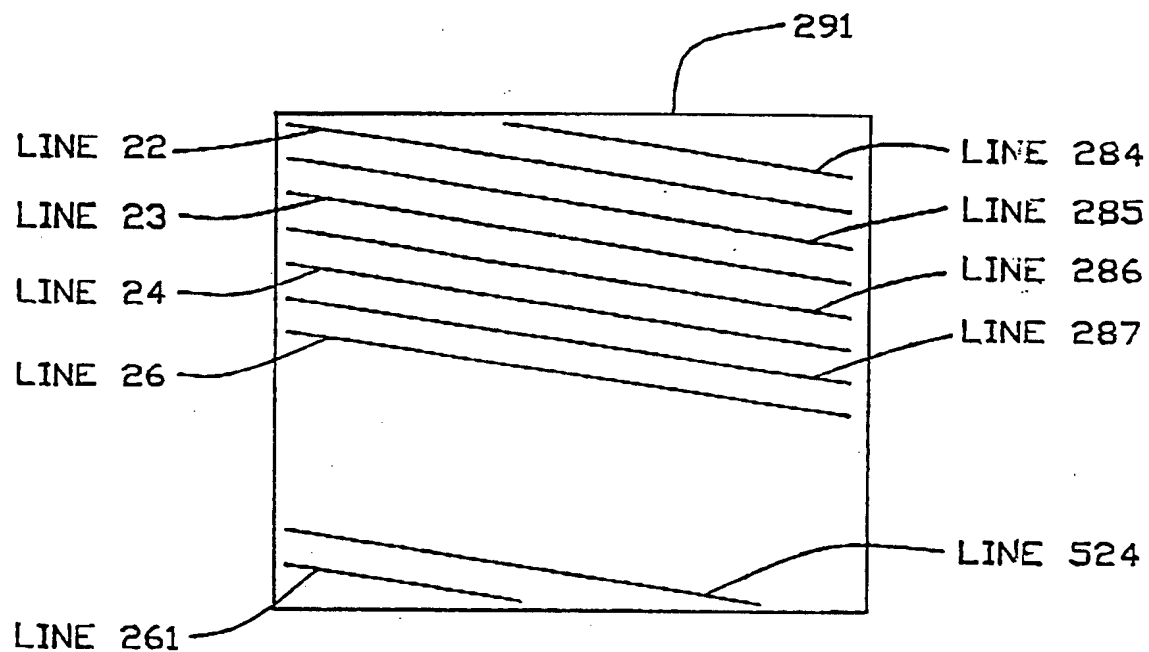
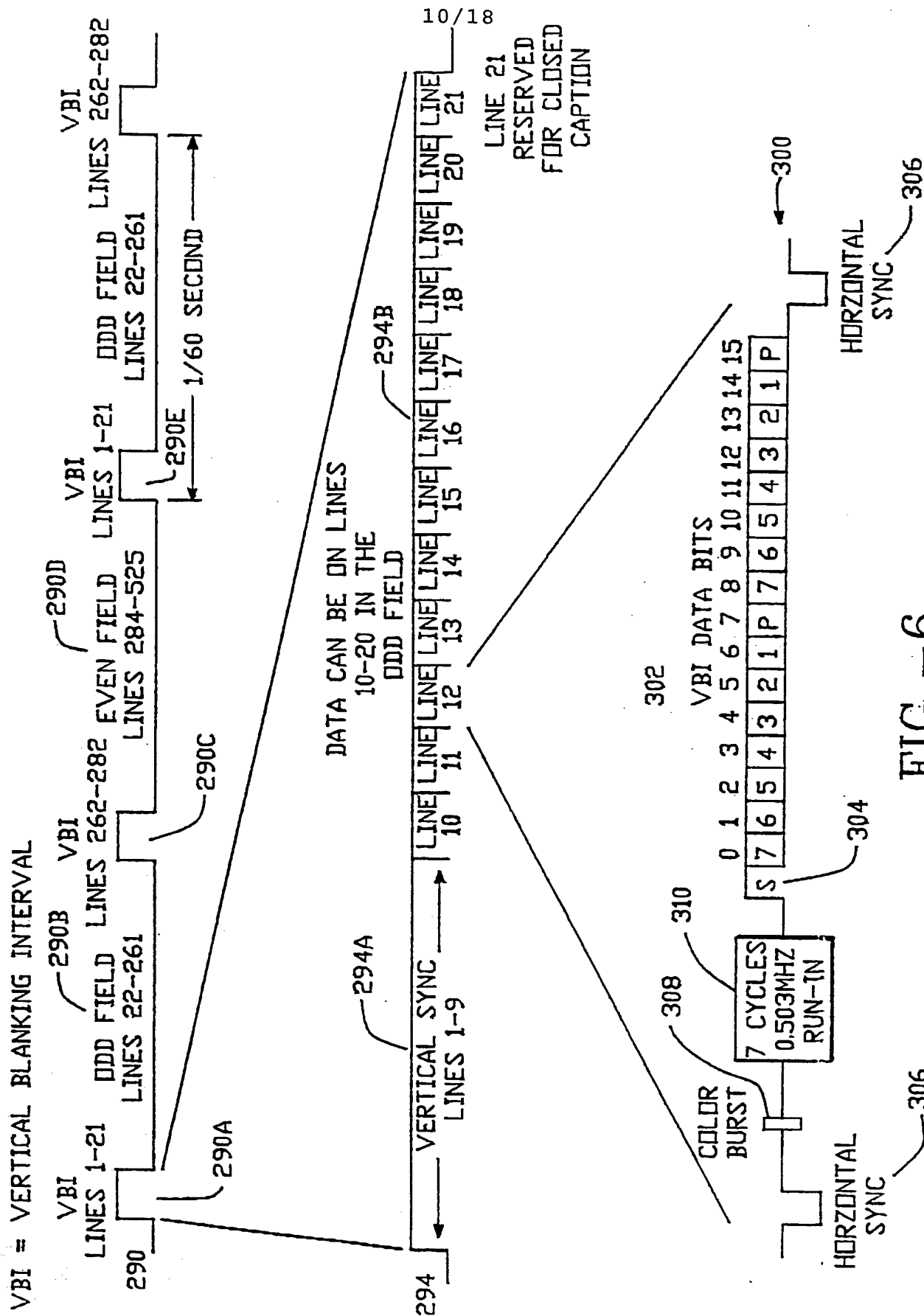


FIG.-5



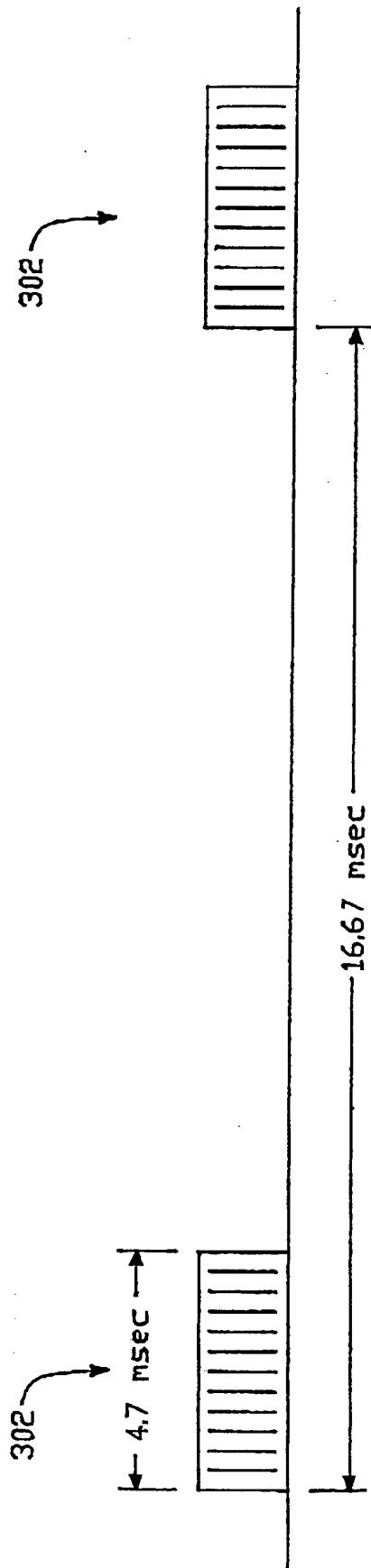


FIG. -7

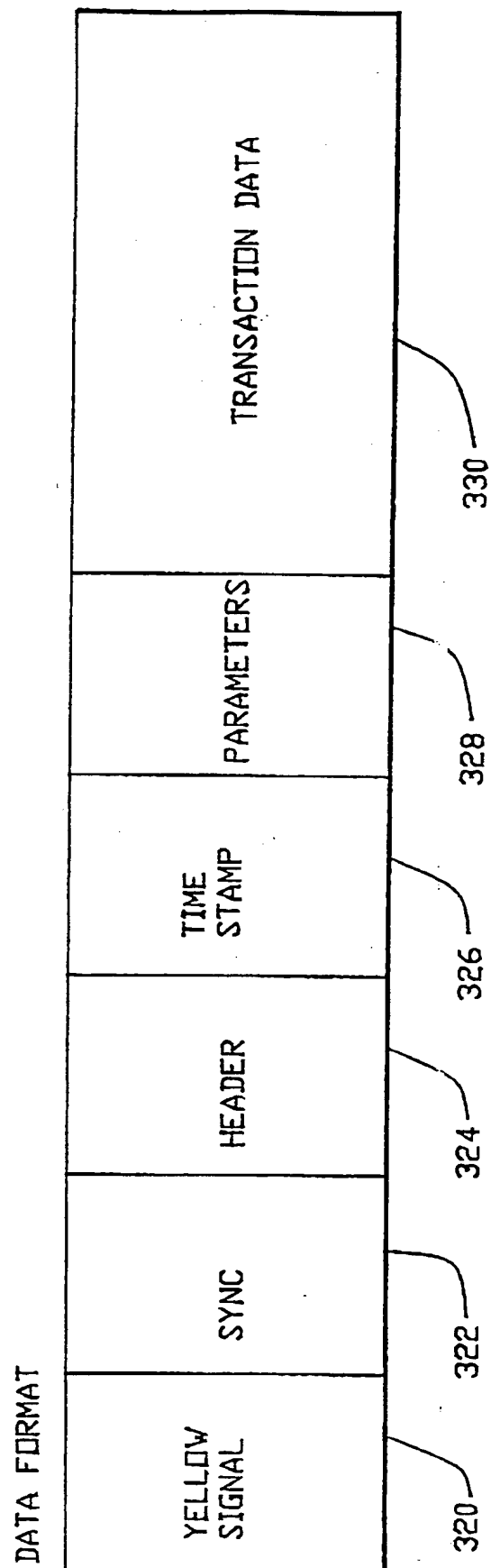
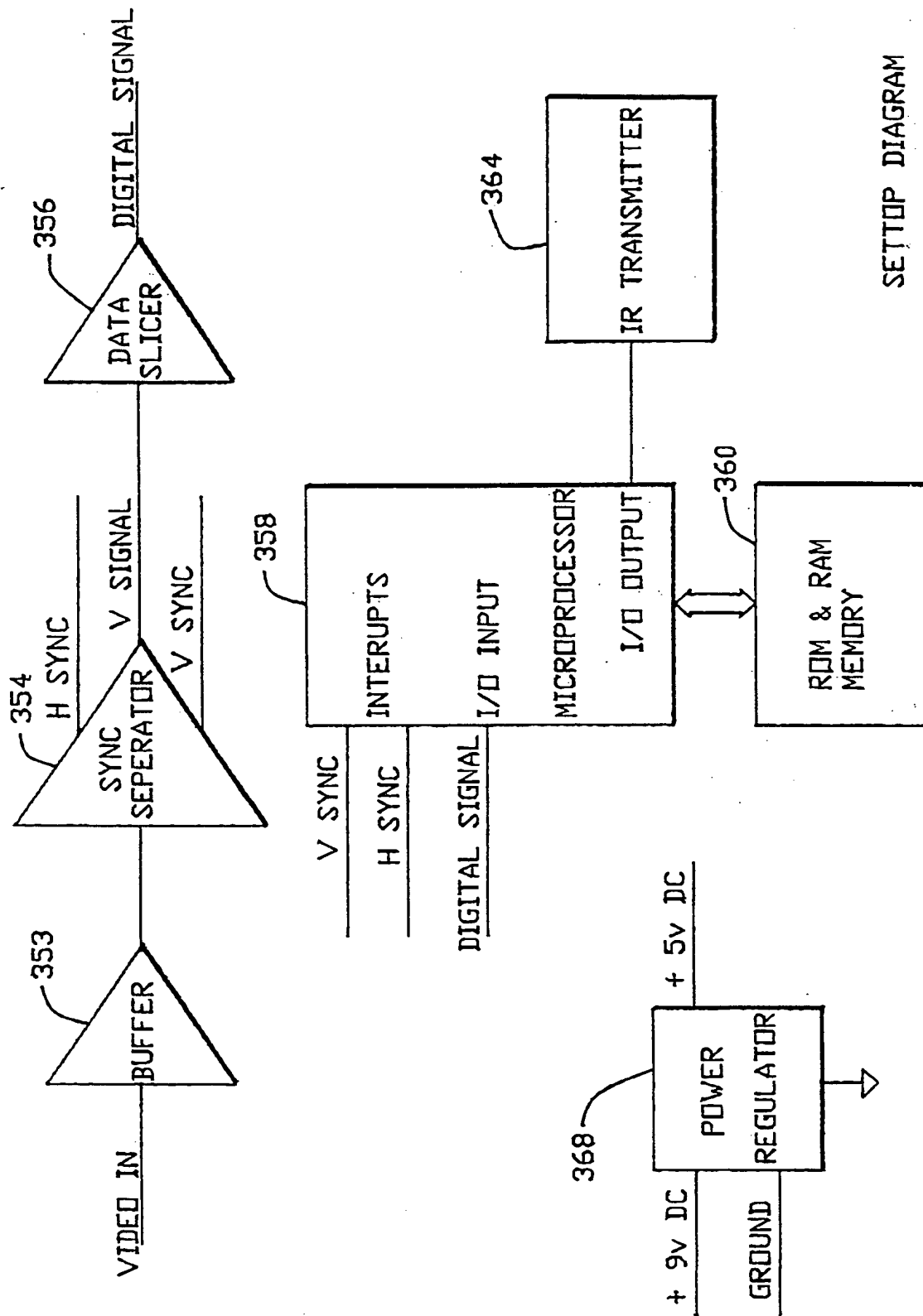


FIG. -8

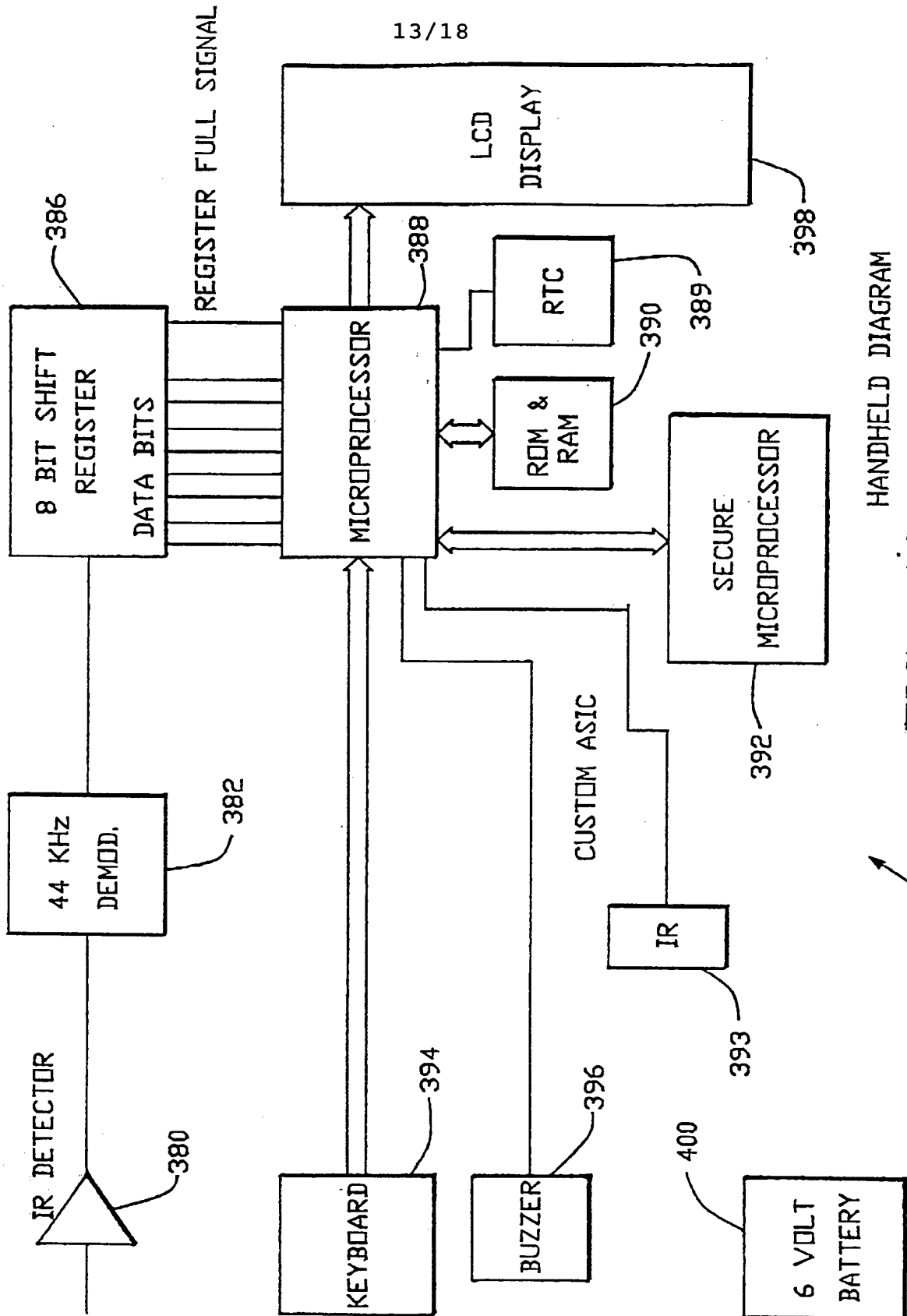
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SETTOP DIAGRAM

CUSTOM ASIC

FIG. -9



HANDHELD DIAGRAM

FIG. -10

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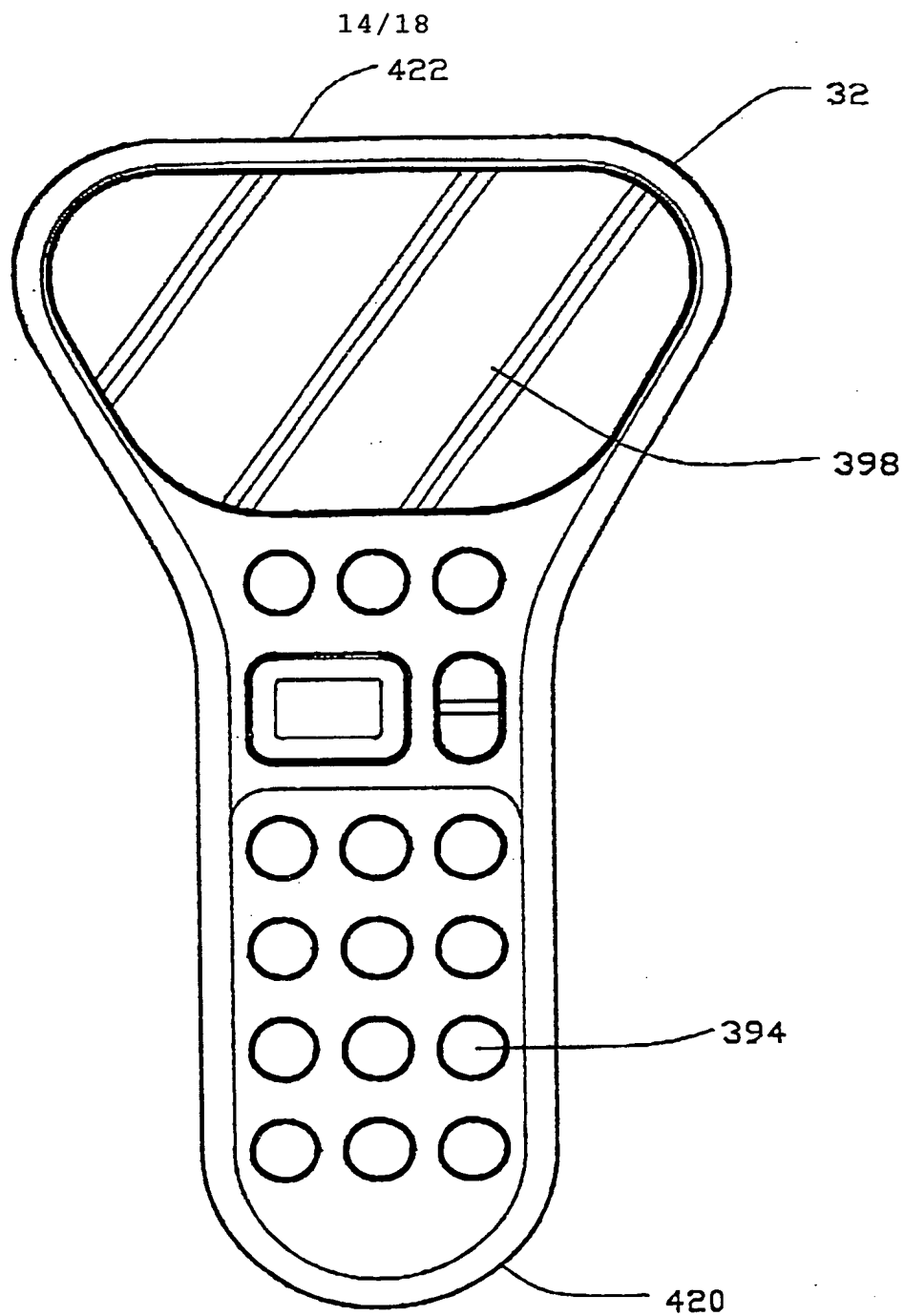
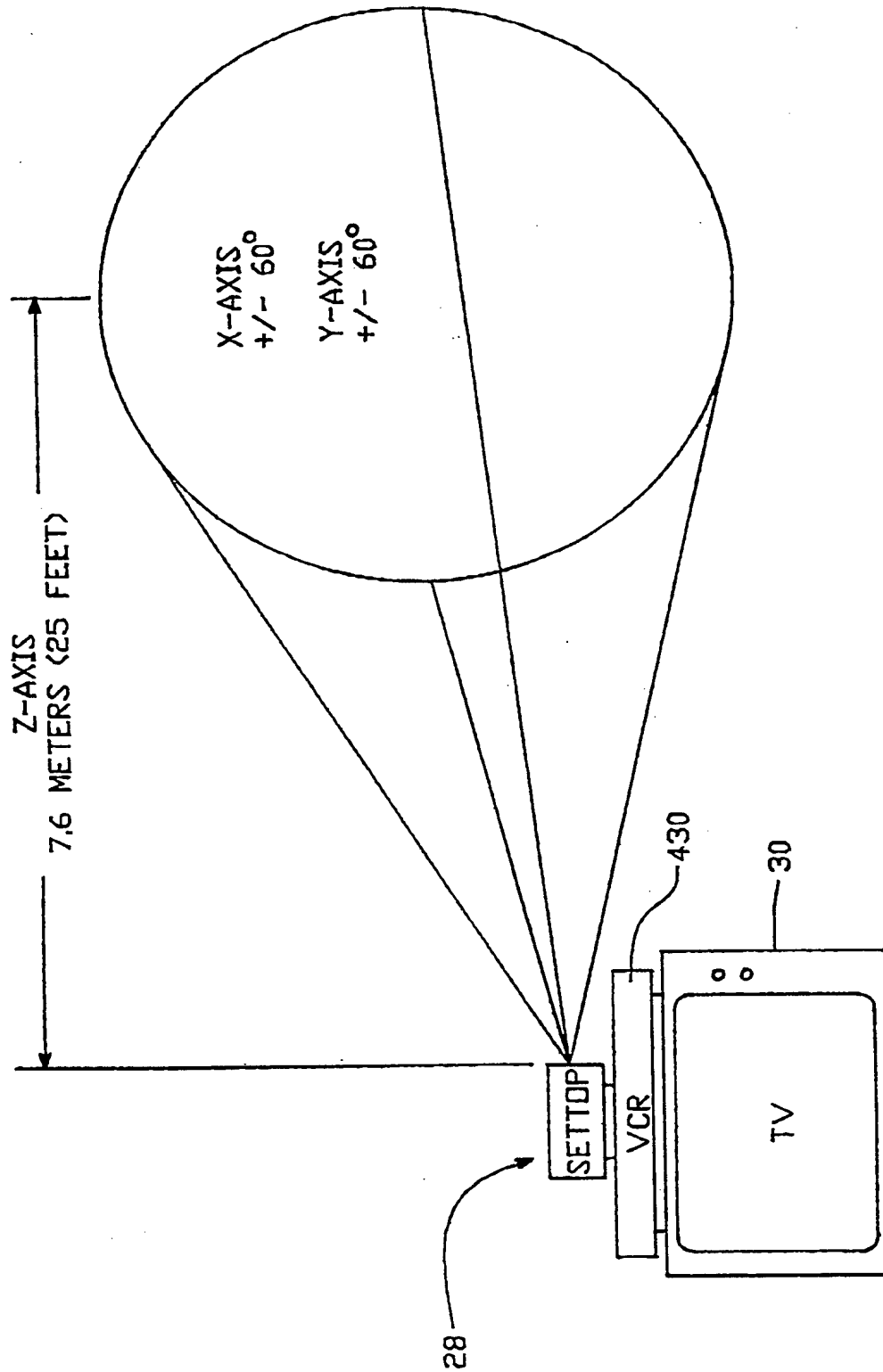


FIG.—11



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INFRARED (IR) COVERAGE AREA

FIG.-12

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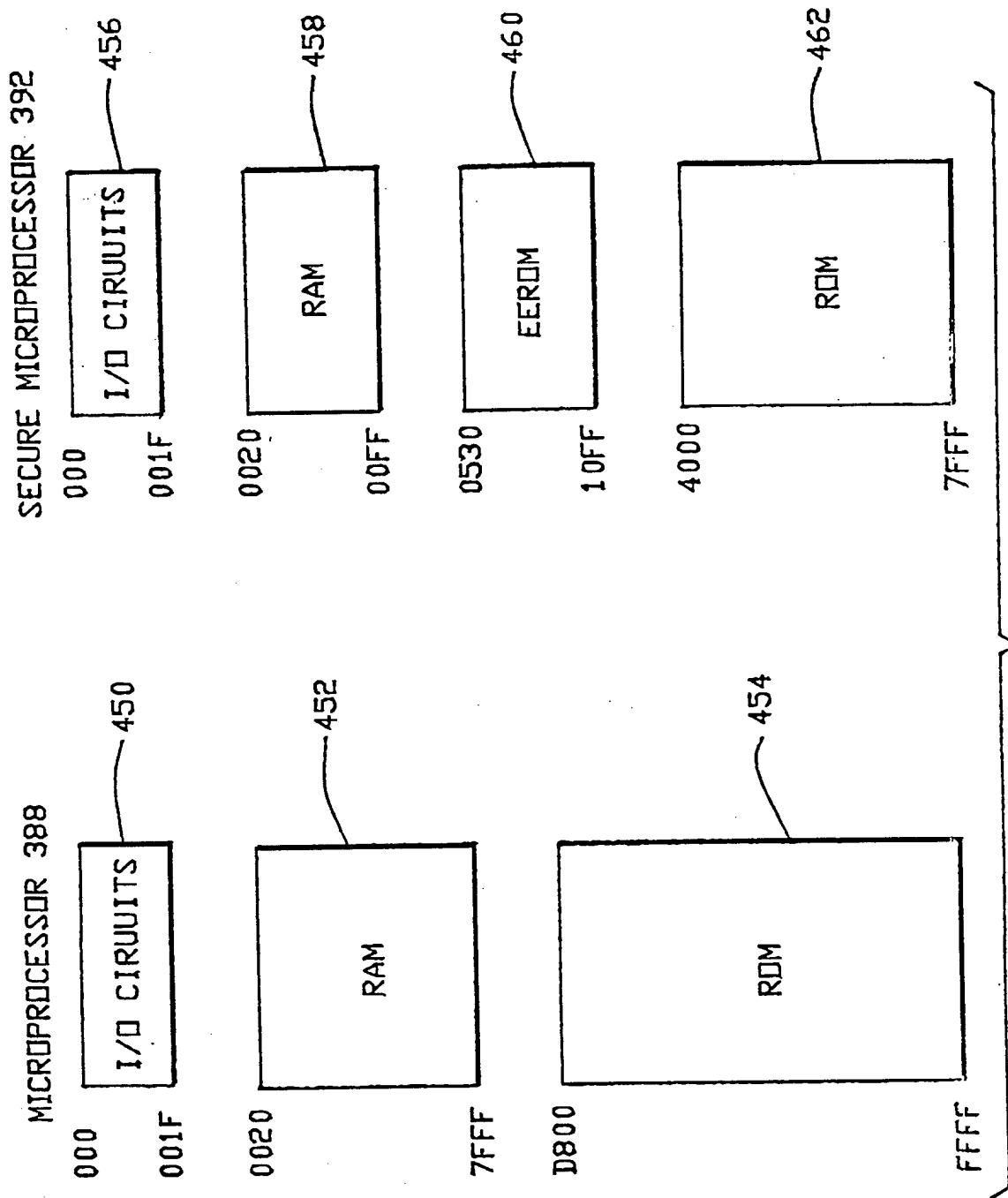


FIG.-13

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MAILBOX	470
GROUP	474
UNIT	478
SCORE	482
CUME	484
SAVE 1	486
SAVE 2	488
SAVE 3	490
SAVE 4	492
SAVE 5	494
SAVE 6	496
SAVE 7	498
BANK	500
SEGMENT / TRANSACTION	502
STATUS	504

FIG.—14

REGISTERS:	INPUT	POINTS	SCORE	CUME
<p>QUESTION:</p> <p>25 PTS. Y/N: DO LIONS HIBERNATE? \</p> <p>THE HANDHELD DISPLAYS THE QUESTION AND THEN WAITS FOR CONSUMERS TO ENTER AN ANSWER.</p>			<p>FOR THIS EXAMPLE WE WILL ASSUME THAT THE CONSUMER'S CURRENT SCORE IS 75 POINTS.</p>	<p>FOR THIS EXAMPLE WE WILL ASSUME THAT THIS SCRIPT IS THE SECOND GAME OF A SERIES; THEREFORE, THE CUME REGISTER IS EQUAL TO THE SCORE REGISTER PLUS THE SCORE FROM THE FIRST GAME.</p>
<p>WRONG:</p> <p>NO. LIONS LIVE IN WARM CLIMATES AND HAVE NO NEED TO HIBERNATE.</p> <p>CONSUMERS WHO ENTER YES WILL SEE THIS RESPONSE MESSAGE.</p>	1	<p>0</p> <p>IF INPUT IS EQUAL TO 1, NO POINTS ARE EARNED.</p>	<p>75</p> <p><math>75 + 0 = 75</math></p> <p>THE SCORE REGISTER IS UPDATED BY THE ADDITION OF THE POINTS REGISTER.</p>	<p>575</p> <p><math>575 + 0 = 575</math></p> <p>THE CUME REGISTER IS UPDATED BY THE ADDITION OF THE POINTS REGISTER.</p>
<p>RIGHT:</p> <p>RIGHT! 25 PTS.</p> <p>CONSUMERS WHO ENTER NO WILL SEE THIS RESPONSE MESSAGE.</p>	2	<p>25</p> <p>IF INPUT IS EQUAL TO 2, THEN 25 POINTS ARE EARNED.</p>	<p>100</p> <p><math>75 + 25 = 100</math></p> <p>THE SCORE REGISTER IS UPDATED BY THE ADDITION OF THE POINTS REGISTER.</p>	<p>600</p> <p><math>575 + 25 = 600</math></p> <p>THE CUME REGISTER IS UPDATED BY THE ADDITION OF THE POINTS REGISTER.</p>

FIG.-15

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US94/13484

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04N 7/14

US CL :348/12

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/12, 6, 7, 10, 13; 455/3.1, 3.2, 4.1, 4.2, 5.1, 6.3; H04N 7/10, 7/14, 7/167, 7/173

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
none

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
none

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4,926,255 (VON KOHORN) 15 May 1990 see entire document	1-49

☐

Further documents are listed in the continuation of Box C.

☐

See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be part of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

23 FEBRUARY 1995

Date of mailing of the international search report

24 MAR 1995

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